```
% Program to Calculate Electrical Component Values for Oscillator
System of Coil #1
syms t C1 C2 C3 L1 R1 Rs Rd Rl1 Vbias Vdd1 Vdd Vdds IDss Vss Vg I1
 I2 I3 I4 Xc1 Xc2 Xc3 Xl1 Gm f pi;
syms Amplitude;
syms Gm0 Vgs Vgoff;
syms M1 M2 B1 Result1 M3 M4 B2 Result2 sign1 sign2;
syms Fcx;
pi = 3.14159;
C1 = 0.000000000680*1000;
C2 = 0.000000000075*1000;
C3 = 0.000000000047*1000;
L1 = 0.0000013*1000;
R1 = 1000000*1000;
Rd = 6800*1000;
f = 1/(2*pi*(L1*C1*C2/(C1 + C2))^(1/2));
Rl1 = 2*pi*f*L1;
Vdd = 12*1000;
Vg = sin(2*pi*f);
Xc1 = 1/(2*pi*f*C1);
Xc2 = 1/(2*pi*f*C2);
Xc3 = 1/(2*pi*f*C3);
Xl1 = 2*pi*f*L1;
IDss = 0.003*1000;
Vgoff = 1.5*1000;
Gm0 = -2*IDss/Vgoff;
Vgs = -2*1000;
Gm = (Vgoff/(Gm0*Vgs)) + 1;
Rs = Rd - (1/Gm);
Vss = IDss*Rs;
Vdd1 = Gm*Rd*Vg;
Amplitude = 0.0039;
Vbias = 0.0039;
M1 = [(Xl1 + Xc1 + Xc2 + Rl1) (-1*Xc1) (-1*Xc2) (0.0);];
M1 = [M1; (-1*Xc1) (Xc1 + Rs) (-1*Rs) (0.0);];
M1 = [M1; (-1*Xc2) (-1*Rs) (Xc2 + Rs + Xc3) (0.0);];
M1 = [M1; (0.0) (0.0) (0.0) (R1 + Rd);];
B1 = [(Vg); (Vss); (-1*Vss + Vdds); (Vdd + Vbias);];
M2 = [B1(1) (-1*Xc1) (-1*Xc2) (0.0);];
M2 = [M2; B1(2) (Xc1 + Rs) (-1*Rs) (0.0);];
M2 = [M2; B1(3) (-1*Rs) (Xc2 + Rs + Xc3) (0.0);];
M2 = [M2; B1(4) (0.0) (0.0) (R1 + Rd);];
Result1 = abs(det(M2)/det(M1));
%
% Now, you want to design a circuit that has Fc times the freq. of
 circuit 1
% and Ac times the amp. of circuit 1
syms Fc Ac Ac1 Xc1a Xc2a Rsa;
```

```
Vg = Ac1*sin(2*pi*f*Fc);
% Xc2a is the reactance for the second capacitor adjusted for Fc a
nd Ac1
Fcx = ((2*2*pi*pi)/(Fc*Fc*f*f))*(C1*0.000000001 + C2*0.000000001)/
(C1*0.000000001*C2*0.000000001*L1);
Xc1a = 1/(2*pi*f*C1*0.000000001*Fcx);
Xc2a = 1/(2*pi*f*C2*0.000000001*Fcx);
Rsa = Rd*Ac1 - (1/Gm);
M3 = [(Xl1*Ac1 + Xc1a*Ac1 + Xc2a + Rl1*Ac1) (-1*Xc1a*Ac1) (-1*Xc2a
) (0.0);];
M3 = [M3; (-1*Xc1a*Ac1) (Xc1a*Ac1 + Rsa) (-1*Rsa) (0.0);];
M3 = [M3; (-1*Xc2a) (-1*Rsa) (Xc2a + Rsa + Xc3*Ac1) (0.0);];
M3 = [M3; (0.0) (0.0) (0.0) (R1*Ac1 + Rd*Ac1);];
B2 = [(Vg*Ac1); (IDss*Rsa); (-1*(IDss*Rsa) + Vdds*Ac1); (Vdd*Ac1 +
 Vbias*Ac1);];
M4 = [B2(1) (-1*Xc1a*Ac1) (-1*Xc2a) (0.0);];
M4 = [M4; B2(2) (Xc1a*Ac1 + Rsa) (-1*Rsa) (0.0);];
M4 = [M4; B2(3) (-1*Rsa) (Xc2a + Rsa + Xc3*Ac1) (0.0);];
M4 = [M4; B2(4) (0.0) (0.0) (R1*Ac1 + Rd*Ac1);];
Result2 = abs(det(M4)/det(M3));
sign1 = abs(det(M2)/det(M1))/(det(M2)/det(M1));
sign2 = abs(det(M4)/det(M3))/(det(M4)/det(M3));
cw2out1;
fid = fopen('f:/draw1/colpitts4w2.txt','w');
syms DesiredAmp DesiredAmp1 NewAmp NewAmp2 pAc1 Ac1x2 Closest Clos
estAc1 NAexp;
DesiredAmp = 2.564102564;
Fc = 1000000000/(16983891.6318);
Closest = 0.0;
ClosestAc1 = 0.0;
NAexp = abs(eval((Result2/sin(2*pi*f*Fc))/(Result1/sin(2*pi*f))));
for Ac1 = 1:1000,
  NewAmp = abs(eval(NAexp));
  if abs(NewAmp - DesiredAmp) < abs(Closest - DesiredAmp)
    ClosestAc1 = Ac1;
  end
  if abs(NewAmp - DesiredAmp) < abs(Closest - DesiredAmp)
    Closest = NewAmp;
  end
end
Ac1 = ClosestAc1;
pAc1 = Ac1;
for Ac1x2 = -5:5,
  Ac1 = pAc1 + Ac1x2/10;
  NewAmp2 = abs(eval(NAexp));
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    ClosestAc1 = pAc1 + Ac1x2/10;
  end
```

```
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    Closest = NewAmp2;
  end
end
Ac1 = ClosestAc1;
pAc1 = Ac1;
for Ac1x2 = -5:5,
  Ac1 = pAc1 + Ac1x2/100;
  NewAmp2 = abs(eval(NAexp));
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    ClosestAc1 = pAc1 + Ac1x2/100;
  end
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    Closest = NewAmp2;
  end
end
Ac1 = ClosestAc1;
pAc1 = Ac1;
for Ac1x2 = -5:5,
  Ac1 = pAc1 + Ac1x2/1000;
  NewAmp2 = abs(eval(NAexp));
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    ClosestAc1 = pAc1 + Ac1x2/1000;
  end
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    Closest = NewAmp2;
  end
end
Ac1 = ClosestAc1;
pAc1 = Ac1;
for Ac1x2 = -5:5,
  Ac1 = pAc1 + Ac1x2/10000;
  NewAmp2 = abs(eval(NAexp));
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    ClosestAc1 = pAc1 + Ac1x2/10000;
  end
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    Closest = NewAmp2;
  end
end
fprintf(fid,';\n');
fprintf(fid,';Program colpitts4w2.m - (c) 2003 Leonard Gojer\n');
fprintf(fid,';Computation of Coil Component Parameters for Draw1\n
');
fprintf(fid,';\n');
fprintf(fid,';Initial Frequency and Amplitude Change To Set Up Dra
w1\n');
fprintf(fid,';from Colpitts example in textbook\n');
```

```
fprintf(fid,'\n');
fprintf(fid,';Desired Frequency                              = ');
fprintf(fid,'%35.16f',round(f*Fc));
fprintf(fid,'\n');
fprintf(fid,';Desired Amplification                          = ');
fprintf(fid,'%35.16f',DesiredAmp);
fprintf(fid,'\n');
fprintf(fid,';Initial Result 1 Amplitude                     = ');
fprintf(fid,'%35.16f',Result1);
fprintf(fid,'\n');
fprintf(fid,';Secondary Result 2 Amplitude                   = ');
fprintf(fid,'%35.16f',eval(Result2));
fprintf(fid,'\n');
fprintf(fid,';Computed Ac1\n');
fprintf(fid,';(Component Amplification Factor)               = ');
fprintf(fid,'%35.16f',Ac1);
fprintf(fid,'\n');
fprintf(fid,';Check of Amplification Factor Desired\n');
fprintf(fid,';(Result 2/Result 1)                            = ');
fprintf(fid,'%35.16f',eval(Result2/Result1));
fprintf(fid,'\n');
fprintf(fid,';\n');
fprintf(fid,'(defun c:drawblks()');
fprintf(fid,'\n');
fprintf(fid,'  (progn');
fprintf(fid,'\n');
DesiredAmp1 = DesiredAmp;
syms sacm;
sacm = size(acm);
for i1 = 1:sacm
  DesiredAmp = acm(i1)*DesiredAmp1;
  Fc =  i1*1000000000/(16983891.6318);
  Closest = 0.0;
  for Ac1 = 1:1000,
    NewAmp = abs(eval(NAexp));
    if abs(NewAmp - DesiredAmp) < abs(Closest - DesiredAmp)
      ClosestAc1 = Ac1;
    end
    if abs(NewAmp - DesiredAmp) < abs(Closest - DesiredAmp)
      Closest = NewAmp;
    end
  end
  Ac1 = ClosestAc1;
  pAc1 = Ac1;
  for Ac1x2 = -5:5,
    Ac1 = pAc1 + Ac1x2/10;
    NewAmp2 = abs(eval(NAexp));
    if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
```

```
    ClosestAc1 = pAc1 + Ac1x2/10;
  end
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    Closest = NewAmp2;
  end
end
Ac1 = ClosestAc1;
pAc1 = Ac1;
for Ac1x2 = -5:5,
  Ac1 = pAc1 + Ac1x2/100;
  NewAmp2 = abs(eval(NAexp));
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    ClosestAc1 = pAc1 + Ac1x2/100;
  end
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    Closest = NewAmp2;
  end
end
Ac1 = ClosestAc1;
pAc1 = Ac1;
for Ac1x2 = -5:5,
  Ac1 = pAc1 + Ac1x2/1000;
  NewAmp2 = abs(eval(NAexp));
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    ClosestAc1 = pAc1 + Ac1x2/1000;
  end
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    Closest = NewAmp2;
  end
end
Ac1 = ClosestAc1;
pAc1 = Ac1;
for Ac1x2 = -5:5,
  Ac1 = pAc1 + Ac1x2/10000;
  NewAmp2 = abs(eval(NAexp));
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    ClosestAc1 = pAc1 + Ac1x2/10000;
  end
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    Closest = NewAmp2;
  end
end
Ac1 = ClosestAc1;
fprintf(fid,';\n');
fprintf(fid,';Desired Frequency                    = ');
fprintf(fid,'%35.16f',round(f*Fc));
fprintf(fid,'\n');
fprintf(fid,';Desired Amplification                = ');
```

```
fprintf(fid,'%35.16f',DesiredAmp);
fprintf(fid,'\n');
fprintf(fid,';Initial Result 1 Amplitude                = ');
fprintf(fid,'%35.16f',Result1);
fprintf(fid,'\n');
fprintf(fid,';Secondary Result 2 Amplitude              = ');
fprintf(fid,'%35.16f',eval(Result2));
fprintf(fid,'\n');
fprintf(fid,';Computed Ac1\n');
fprintf(fid,';(Component Amplification Factor)          = ');
fprintf(fid,'%35.16f',Ac1);
fprintf(fid,'\n');
fprintf(fid,';Check of Amplification Factor Desired\n');
fprintf(fid,';(Result 2/Result 1)                       = ');
fprintf(fid,'%35.16f',eval(Result2/Result1));
fprintf(fid,'\n');
fprintf(fid,';Sign 1 (sign of Result 1)                 = ');
fprintf(fid,'%35.16f',sign1);
fprintf(fid,'\n');
fprintf(fid,';Sign 2 (sign of Result 2)                 = ');
fprintf(fid,'%35.16f',eval(sign2));
fprintf(fid,'\n');
fprintf(fid,';L1                                        = ');
fprintf(fid,'%35.16f',L1*Ac1);
fprintf(fid,'\n');
fprintf(fid,';C1                                        = ');
fprintf(fid,'%35.16f',eval(C1*Fcx/Ac1));
fprintf(fid,'\n');
fprintf(fid,';C2                                        = ');
fprintf(fid,'%35.16f',eval(C2*Fcx/Ac1));
fprintf(fid,'\n');
fprintf(fid,';C3                                        = ');
fprintf(fid,'%35.16f',C3/Ac1);
fprintf(fid,'\n');
fprintf(fid,';Rd                                        = ');
fprintf(fid,'%35.16f',Rd*Ac1);
fprintf(fid,'\n');
fprintf(fid,';R1                                        = ');
fprintf(fid,'%35.16f',R1*Ac1);
fprintf(fid,'\n');
fprintf(fid,';Rl1                                       = ');
fprintf(fid,'%35.16f',Rl1*Ac1);
fprintf(fid,'\n');
fprintf(fid,';\n');
fprintf(fid,';\n');
fprintf(fid,'    (setq count ');
fprintf(fid,'%22.16f',i1);
fprintf(fid,')\n');
```

```
  fprintf(fid,'    (setq DesFreq ');
  fprintf(fid,'%22.16f',round(f*Fc));
  fprintf(fid,')\n');
  fprintf(fid,'    (setq DesAmp ');
  fprintf(fid,'%22.16f',DesiredAmp);
  fprintf(fid,')\n');
  fprintf(fid,'    (setq Init1Amp ');
  fprintf(fid,'%22.16f',Result1);
  fprintf(fid,')\n');
  fprintf(fid,'    (setq Sec2Amp ');
  fprintf(fid,'%22.16f',eval(Result2));
  fprintf(fid,')\n');
  fprintf(fid,'    (setq CompAc1 ');
  fprintf(fid,'%22.16f',Ac1);
  fprintf(fid,')\n');
  fprintf(fid,'    (setq CheckAmp ');
  fprintf(fid,'%22.16f',eval(Result2/Result1));
  fprintf(fid,')\n');
  fprintf(fid,'    (setq Sign1 ');
  fprintf(fid,'%22.16f',sign1);
  fprintf(fid,')\n');
  fprintf(fid,'    (setq Sign2 ');
  fprintf(fid,'%22.16f',eval(sign2));
  fprintf(fid,')\n');
  fprintf(fid,'    (setq L1 ');
  fprintf(fid,'%22.16f',L1*Ac1);
  fprintf(fid,')\n');
  fprintf(fid,'    (setq C1 ');
  fprintf(fid,'%22.16f',eval(C1*Fcx/Ac1));
  fprintf(fid,')\n');
  fprintf(fid,'    (setq C2 ');
  fprintf(fid,'%22.16f',eval(C2*Fcx/Ac1));
  fprintf(fid,')\n');
  fprintf(fid,'    (setq C3 ');
  fprintf(fid,'%22.16f',C3/Ac1);
  fprintf(fid,')\n');
  fprintf(fid,'    (setq Rd ');
  fprintf(fid,'%22.16f',Rd*Ac1);
  fprintf(fid,')\n');
  fprintf(fid,'    (setq R1 ');
  fprintf(fid,'%22.16f',R1*Ac1);
  fprintf(fid,')\n');
  fprintf(fid,'    (setq Rl1 ');
  fprintf(fid,'%22.16f',Rl1*Ac1);
  fprintf(fid,')\n');
  fprintf(fid,'    (insblkd count DesFreq DesAmp Init1Amp Sec2Amp
CompAc1 CheckAmp Sign1 Sign2');
  fprintf(fid,' L1 C1 C2 C3 Rd R1 Rl1)\n');
```

```
  fprintf(fid,';\n');
 end
fprintf(fid,'  )');
fprintf(fid,'\n');
fprintf(fid,')');
fprintf(fid,'\n');
fclose(fid);
```

```
% Program to Calculate Electrical Component Values for Oscillator
System of Coil #2
syms t C1 C2 C3 L1 R1 Rs Rd Rl1 Vbias Vdd1 Vdd Vdds IDss Vss Vg I1
 I2 I3 I4 Xc1 Xc2 Xc3 Xl1 Gm f pi;
syms Amplitude;
syms Gm0 Vgs Vgoff;
syms M1 M2 B1 Result1 M3 M4 B2 Result2 sign1 sign2;
syms Fcx;
pi = 3.14159;
C1 = 0.000000000680*1000;
C2 = 0.000000000075*1000;
C3 = 0.000000000047*1000;
L1 = 0.0000013*1000;
R1 = 1000000*1000;
Rd = 6800*1000;
f = 1/(2*pi*(L1*C1*C2/(C1 + C2))^(1/2));
Rl1 = 2*pi*f*L1;
Vdd = 12*1000;
Vg = sin(2*pi*f);
Xc1 = 1/(2*pi*f*C1);
Xc2 = 1/(2*pi*f*C2);
Xc3 = 1/(2*pi*f*C3);
Xl1 = 2*pi*f*L1;
IDss = 0.003*1000;
Vgoff = 1.5*1000;
Gm0 = -2*IDss/Vgoff;
Vgs = -2*1000;
Gm = (Vgoff/(Gm0*Vgs)) + 1;
Rs = Rd - (1/Gm);
Vss = IDss*Rs;
Vdd1 = Gm*Rd*Vg;
Amplitude = 0.0039;
Vbias = 0.0039;
M1 = [(Xl1 + Xc1 + Xc2 + Rl1) (-1*Xc1) (-1*Xc2) (0.0);];
M1 = [M1; (-1*Xc1) (Xc1 + Rs) (-1*Rs) (0.0);];
M1 = [M1; (-1*Xc2) (-1*Rs) (Xc2 + Rs + Xc3) (0.0);];
M1 = [M1; (0.0) (0.0) (0.0) (R1 + Rd);];
B1 = [(Vg); (Vss); (-1*Vss + Vdds); (Vdd + Vbias);];
M2 = [B1(1) (-1*Xc1) (-1*Xc2) (0.0);];
M2 = [M2; B1(2) (Xc1 + Rs) (-1*Rs) (0.0);];
M2 = [M2; B1(3) (-1*Rs) (Xc2 + Rs + Xc3) (0.0);];
M2 = [M2; B1(4) (0.0) (0.0) (R1 + Rd);];
Result1 = abs(det(M2)/det(M1));
%
% Now, you want to design a circuit that has Fc times the freq. of
 circuit 1
% and Ac times the amp. of circuit 1
syms Fc Ac Ac1 Xc1a Xc2a Rsa;
```

```
Vg = Ac1*sin(2*pi*f*Fc);
% Xc2a is the reactance for the second capacitor adjusted for Fc a
nd Ac1
Fcx = ((2*2*pi*pi)/(Fc*Fc*f*f))*(C1*0.000000001 + C2*0.000000001)/
(C1*0.000000001*C2*0.000000001*L1);
Xc1a = 1/(2*pi*f*C1*0.000000001*Fcx);
Xc2a = 1/(2*pi*f*C2*0.000000001*Fcx);
Rsa = Rd*Ac1 - (1/Gm);
M3 = [(Xl1*Ac1 + Xc1a*Ac1 + Xc2a + Rl1*Ac1) (-1*Xc1a*Ac1) (-1*Xc2a
) (0.0);];
M3 = [M3; (-1*Xc1a*Ac1) (Xc1a*Ac1 + Rsa) (-1*Rsa) (0.0);];
M3 = [M3; (-1*Xc2a) (-1*Rsa) (Xc2a + Rsa + Xc3*Ac1) (0.0);];
M3 = [M3; (0.0) (0.0) (0.0) (R1*Ac1 + Rd*Ac1);];
B2 = [(Vg*Ac1); (IDss*Rsa); (-1*(IDss*Rsa) + Vdds*Ac1); (Vdd*Ac1 +
 Vbias*Ac1);];
M4 = [B2(1) (-1*Xc1a*Ac1) (-1*Xc2a) (0.0);];
M4 = [M4; B2(2) (Xc1a*Ac1 + Rsa) (-1*Rsa) (0.0);];
M4 = [M4; B2(3) (-1*Rsa) (Xc2a + Rsa + Xc3*Ac1) (0.0);];
M4 = [M4; B2(4) (0.0) (0.0) (R1*Ac1 + Rd*Ac1);];
Result2 = abs(det(M4)/det(M3));
sign1 = abs(det(M2)/det(M1))/(det(M2)/det(M1));
sign2 = abs(det(M4)/det(M3))/(det(M4)/det(M3));
cw4out1;
fid = fopen('f:/draw1/colpitts4w4.txt','w');
syms DesiredAmp DesiredAmp1 NewAmp NewAmp2 pAc1 Ac1x2 Closest Clos
estAc1 NAexp;
DesiredAmp = 2.564102564;
Fc = 1000000000/(16983891.6318);
Closest = 0.0;
ClosestAc1 = 0.0;
NAexp = abs(eval((Result2/sin(2*pi*f*Fc))/(Result1/sin(2*pi*f))));
for Ac1 = 1:1000,
  NewAmp = abs(eval(NAexp));
  if abs(NewAmp - DesiredAmp) < abs(Closest - DesiredAmp)
    ClosestAc1 = Ac1;
  end
  if abs(NewAmp - DesiredAmp) < abs(Closest - DesiredAmp)
    Closest = NewAmp;
  end
end
Ac1 = ClosestAc1;
pAc1 = Ac1;
for Ac1x2 = -5:5,
  Ac1 = pAc1 + Ac1x2/10;
  NewAmp2 = abs(eval(NAexp));
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    ClosestAc1 = pAc1 + Ac1x2/10;
  end
```

```
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    Closest = NewAmp2;
  end
end
Ac1 = ClosestAc1;
pAc1 = Ac1;
for Ac1x2 = -5:5,
  Ac1 = pAc1 + Ac1x2/100;
  NewAmp2 = abs(eval(NAexp));
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    ClosestAc1 = pAc1 + Ac1x2/100;
  end
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    Closest = NewAmp2;
  end
end
Ac1 = ClosestAc1;
pAc1 = Ac1;
for Ac1x2 = -5:5,
  Ac1 = pAc1 + Ac1x2/1000;
  NewAmp2 = abs(eval(NAexp));
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    ClosestAc1 = pAc1 + Ac1x2/1000;
  end
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    Closest = NewAmp2;
  end
end
Ac1 = ClosestAc1;
pAc1 = Ac1;
for Ac1x2 = -5:5,
  Ac1 = pAc1 + Ac1x2/10000;
  NewAmp2 = abs(eval(NAexp));
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    ClosestAc1 = pAc1 + Ac1x2/10000;
  end
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    Closest = NewAmp2;
  end
end
fprintf(fid,';\n');
fprintf(fid,';Program colpitts4w4.m - (c) 2003 Leonard Gojer\n');
fprintf(fid,';Computation of Coil Component Parameters for Draw1\n
');
fprintf(fid,';\n');
fprintf(fid,';Initial Frequency and Amplitude Change To Set Up Dra
w1\n');
fprintf(fid,';from Colpitts example in textbook\n');
```

```
fprintf(fid,'\n');
fprintf(fid,';Desired Frequency                          = ');
fprintf(fid,'%35.16f',round(f*Fc));
fprintf(fid,'\n');
fprintf(fid,';Desired Amplification                      = ');
fprintf(fid,'%35.16f',DesiredAmp);
fprintf(fid,'\n');
fprintf(fid,';Initial Result 1 Amplitude                 = ');
fprintf(fid,'%35.16f',Result1);
fprintf(fid,'\n');
fprintf(fid,';Secondary Result 2 Amplitude               = ');
fprintf(fid,'%35.16f',eval(Result2));
fprintf(fid,'\n');
fprintf(fid,';Computed Ac1\n');
fprintf(fid,';(Component Amplification Factor)           = ');
fprintf(fid,'%35.16f',Ac1);
fprintf(fid,'\n');
fprintf(fid,';Check of Amplification Factor Desired\n');
fprintf(fid,';(Result 2/Result 1)                        = ');
fprintf(fid,'%35.16f',eval(Result2/Result1));
fprintf(fid,'\n');
fprintf(fid,';\n');
fprintf(fid,'(defun c:drawblks()');
fprintf(fid,'\n');
fprintf(fid,'  (progn');
fprintf(fid,'\n');
DesiredAmp1 = DesiredAmp;
syms sacm;
sacm = size(acm);
for i1 = 1:sacm
  DesiredAmp = acm(i1)*DesiredAmp1;
  Fc =  i1*1000000000/(16983891.6318);
  Closest = 0.0;
  for Ac1 = 1:1000,
    NewAmp = abs(eval(NAexp));
    if abs(NewAmp - DesiredAmp) < abs(Closest - DesiredAmp)
      ClosestAc1 = Ac1;
    end
    if abs(NewAmp - DesiredAmp) < abs(Closest - DesiredAmp)
      Closest = NewAmp;
    end
  end
  Ac1 = ClosestAc1;
  pAc1 = Ac1;
  for Ac1x2 = -5:5,
    Ac1 = pAc1 + Ac1x2/10;
    NewAmp2 = abs(eval(NAexp));
    if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
```

```
    ClosestAc1 = pAc1 + Ac1x2/10;
  end
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    Closest = NewAmp2;
  end
end
Ac1 = ClosestAc1;
pAc1 = Ac1;
for Ac1x2 = -5:5,
  Ac1 = pAc1 + Ac1x2/100;
  NewAmp2 = abs(eval(NAexp));
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    ClosestAc1 = pAc1 + Ac1x2/100;
  end
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    Closest = NewAmp2;
  end
end
Ac1 = ClosestAc1;
pAc1 = Ac1;
for Ac1x2 = -5:5,
  Ac1 = pAc1 + Ac1x2/1000;
  NewAmp2 = abs(eval(NAexp));
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    ClosestAc1 = pAc1 + Ac1x2/1000;
  end
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    Closest = NewAmp2;
  end
end
Ac1 = ClosestAc1;
pAc1 = Ac1;
for Ac1x2 = -5:5,
  Ac1 = pAc1 + Ac1x2/10000;
  NewAmp2 = abs(eval(NAexp));
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    ClosestAc1 = pAc1 + Ac1x2/10000;
  end
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    Closest = NewAmp2;
  end
end
Ac1 = ClosestAc1;
fprintf(fid,';\n');
fprintf(fid,';Desired Frequency                    = ');
fprintf(fid,'%35.16f',round(f*Fc));
fprintf(fid,'\n');
fprintf(fid,';Desired Amplification                = ');
```

```
fprintf(fid,'%35.16f',DesiredAmp);
fprintf(fid,'\n');
fprintf(fid,';Initial Result 1 Amplitude                = ');
fprintf(fid,'%35.16f',Result1);
fprintf(fid,'\n');
fprintf(fid,';Secondary Result 2 Amplitude              = ');
fprintf(fid,'%35.16f',eval(Result2));
fprintf(fid,'\n');
fprintf(fid,';Computed Ac1\n');
fprintf(fid,';(Component Amplification Factor)          = ');
fprintf(fid,'%35.16f',Ac1);
fprintf(fid,'\n');
fprintf(fid,';Check of Amplification Factor Desired\n');
fprintf(fid,';(Result 2/Result 1)                       = ');
fprintf(fid,'%35.16f',eval(Result2/Result1));
fprintf(fid,'\n');
fprintf(fid,';Sign 1 (sign of Result 1)                 = ');
fprintf(fid,'%35.16f',sign1);
fprintf(fid,'\n');
fprintf(fid,';Sign 2 (sign of Result 2)                 = ');
fprintf(fid,'%35.16f',eval(sign2));
fprintf(fid,'\n');
fprintf(fid,';L1                                        = ');
fprintf(fid,'%35.16f',L1*Ac1);
fprintf(fid,'\n');
fprintf(fid,';C1                                        = ');
fprintf(fid,'%35.16f',eval(C1*Fcx/Ac1));
fprintf(fid,'\n');
fprintf(fid,';C2                                        = ');
fprintf(fid,'%35.16f',eval(C2*Fcx/Ac1));
fprintf(fid,'\n');
fprintf(fid,';C3                                        = ');
fprintf(fid,'%35.16f',C3/Ac1);
fprintf(fid,'\n');
fprintf(fid,';Rd                                        = ');
fprintf(fid,'%35.16f',Rd*Ac1);
fprintf(fid,'\n');
fprintf(fid,';R1                                        = ');
fprintf(fid,'%35.16f',R1*Ac1);
fprintf(fid,'\n');
fprintf(fid,';R11                                       = ');
fprintf(fid,'%35.16f',R11*Ac1);
fprintf(fid,'\n');
fprintf(fid,';\n');
fprintf(fid,';\n');
fprintf(fid,'    (setq count ');
fprintf(fid,'%22.16f',i1);
fprintf(fid,')\n');
```

```
  fprintf(fid,'    (setq DesFreq ');
  fprintf(fid,'%22.16f',round(f*Fc));
  fprintf(fid,')\n');
  fprintf(fid,'    (setq DesAmp ');
  fprintf(fid,'%22.16f',DesiredAmp);
  fprintf(fid,')\n');
  fprintf(fid,'    (setq Init1Amp ');
  fprintf(fid,'%22.16f',Result1);
  fprintf(fid,')\n');
  fprintf(fid,'    (setq Sec2Amp ');
  fprintf(fid,'%22.16f',eval(Result2));
  fprintf(fid,')\n');
  fprintf(fid,'    (setq CompAc1 ');
  fprintf(fid,'%22.16f',Ac1);
  fprintf(fid,')\n');
  fprintf(fid,'    (setq CheckAmp ');
  fprintf(fid,'%22.16f',eval(Result2/Result1));
  fprintf(fid,')\n');
  fprintf(fid,'    (setq Sign1 ');
  fprintf(fid,'%22.16f',sign1);
  fprintf(fid,')\n');
  fprintf(fid,'    (setq Sign2 ');
  fprintf(fid,'%22.16f',eval(sign2));
  fprintf(fid,')\n');
  fprintf(fid,'    (setq L1 ');
  fprintf(fid,'%22.16f',L1*Ac1);
  fprintf(fid,')\n');
  fprintf(fid,'    (setq C1 ');
  fprintf(fid,'%22.16f',eval(C1*Fcx/Ac1));
  fprintf(fid,')\n');
  fprintf(fid,'    (setq C2 ');
  fprintf(fid,'%22.16f',eval(C2*Fcx/Ac1));
  fprintf(fid,')\n');
  fprintf(fid,'    (setq C3 ');
  fprintf(fid,'%22.16f',C3/Ac1);
  fprintf(fid,')\n');
  fprintf(fid,'    (setq Rd ');
  fprintf(fid,'%22.16f',Rd*Ac1);
  fprintf(fid,')\n');
  fprintf(fid,'    (setq R1 ');
  fprintf(fid,'%22.16f',R1*Ac1);
  fprintf(fid,')\n');
  fprintf(fid,'    (setq Rl1 ');
  fprintf(fid,'%22.16f',Rl1*Ac1);
  fprintf(fid,')\n');
  fprintf(fid,'    (insblkd count DesFreq DesAmp Init1Amp Sec2Amp
CompAc1 CheckAmp Sign1 Sign2');
  fprintf(fid,' L1 C1 C2 C3 Rd R1 Rl1)\n');
```

```
  fprintf(fid,';\n');
 end
fprintf(fid,'  )');
fprintf(fid,'\n');
fprintf(fid,')');
fprintf(fid,'\n');
fclose(fid);
```

```
% Program to Calculate Electrical Component Values for Oscillator
System of Coil #3
syms t C1 C2 C3 L1 R1 Rs Rd Rl1 Vbias Vdd1 Vdd Vdds IDss Vss Vg I1
 I2 I3 I4 Xc1 Xc2 Xc3 Xl1 Gm f pi;
syms Amplitude;
syms Gm0 Vgs Vgoff;
syms M1 M2 B1 Result1 M3 M4 B2 Result2 sign1 sign2;
syms Fcx;
pi = 3.14159;
C1 = 0.000000000680*1000;
C2 = 0.000000000075*1000;
C3 = 0.000000000047*1000;
L1 = 0.0000013*1000;
R1 = 1000000*1000;
Rd = 6800*1000;
f = 1/(2*pi*(L1*C1*C2/(C1 + C2))^(1/2));
Rl1 = 2*pi*f*L1;
Vdd = 12*1000;
Vg = sin(2*pi*f);
Xc1 = 1/(2*pi*f*C1);
Xc2 = 1/(2*pi*f*C2);
Xc3 = 1/(2*pi*f*C3);
Xl1 = 2*pi*f*L1;
IDss = 0.003*1000;
Vgoff = 1.5*1000;
Gm0 = -2*IDss/Vgoff;
Vgs = -2*1000;
Gm = (Vgoff/(Gm0*Vgs)) + 1;
Rs = Rd - (1/Gm);
Vss = IDss*Rs;
Vdd1 = Gm*Rd*Vg;
Amplitude = 0.0039;
Vbias = 0.0039;
M1 = [(Xl1 + Xc1 + Xc2 + Rl1) (-1*Xc1) (-1*Xc2) (0.0);];
M1 = [M1; (-1*Xc1) (Xc1 + Rs) (-1*Rs) (0.0);];
M1 = [M1; (-1*Xc2) (-1*Rs) (Xc2 + Rs + Xc3) (0.0);];
M1 = [M1; (0.0) (0.0) (0.0) (R1 + Rd);];
B1 = [(Vg); (Vss); (-1*Vss + Vdds); (Vdd + Vbias);];
M2 = [B1(1) (-1*Xc1) (-1*Xc2) (0.0);];
M2 = [M2; B1(2) (Xc1 + Rs) (-1*Rs) (0.0);];
M2 = [M2; B1(3) (-1*Rs) (Xc2 + Rs + Xc3) (0.0);];
M2 = [M2; B1(4) (0.0) (0.0) (R1 + Rd);];
Result1 = abs(det(M2)/det(M1));
%
% Now, you want to design a circuit that has Fc times the freq. of
 circuit 1
% and Ac times the amp. of circuit 1
syms Fc Ac Ac1 Xc1a Xc2a Rsa;
```

```
Vg = Ac1*sin(2*pi*f*Fc);
% Xc2a is the reactance for the second capacitor adjusted for Fc a
nd Ac1
Fcx = ((2*2*pi*pi)/(Fc*Fc*f*f))*(C1*0.000000001 + C2*0.000000001)/
(C1*0.000000001*C2*0.000000001*L1);
Xc1a = 1/(2*pi*f*C1*0.000000001*Fcx);
Xc2a = 1/(2*pi*f*C2*0.000000001*Fcx);
Rsa = Rd*Ac1 - (1/Gm);
M3 = [(Xl1*Ac1 + Xc1a*Ac1 + Xc2a + Rl1*Ac1) (-1*Xc1a*Ac1) (-1*Xc2a
) (0.0);];
M3 = [M3; (-1*Xc1a*Ac1) (Xc1a*Ac1 + Rsa) (-1*Rsa) (0.0);];
M3 = [M3; (-1*Xc2a) (-1*Rsa) (Xc2a + Rsa + Xc3*Ac1) (0.0);];
M3 = [M3; (0.0) (0.0) (0.0) (R1*Ac1 + Rd*Ac1);];
B2 = [(Vg*Ac1); (IDss*Rsa); (-1*(IDss*Rsa) + Vdds*Ac1); (Vdd*Ac1 +
 Vbias*Ac1);];
M4 = [B2(1) (-1*Xc1a*Ac1) (-1*Xc2a) (0.0);];
M4 = [M4; B2(2) (Xc1a*Ac1 + Rsa) (-1*Rsa) (0.0);];
M4 = [M4; B2(3) (-1*Rsa) (Xc2a + Rsa + Xc3*Ac1) (0.0);];
M4 = [M4; B2(4) (0.0) (0.0) (R1*Ac1 + Rd*Ac1);];
Result2 = abs(det(M4)/det(M3));
sign1 = abs(det(M2)/det(M1))/(det(M2)/det(M1));
sign2 = abs(det(M4)/det(M3))/(det(M4)/det(M3));
cw6out1;
fid = fopen('f:/draw1/colpitts4w6.txt','w');
syms DesiredAmp DesiredAmp1 NewAmp NewAmp2 pAc1 Ac1x2 Closest Clos
estAc1 NAexp;
DesiredAmp = 2.564102564;
Fc = 1000000000/(16983891.6318);
Closest = 0.0;
ClosestAc1 = 0.0;
NAexp = abs(eval((Result2/sin(2*pi*f*Fc))/(Result1/sin(2*pi*f))));
for Ac1 = 1:1000,
  NewAmp = abs(eval(NAexp));
  if abs(NewAmp - DesiredAmp) < abs(Closest - DesiredAmp)
    ClosestAc1 = Ac1;
  end
  if abs(NewAmp - DesiredAmp) < abs(Closest - DesiredAmp)
    Closest = NewAmp;
  end
end
Ac1 = ClosestAc1;
pAc1 = Ac1;
for Ac1x2 = -5:5,
  Ac1 = pAc1 + Ac1x2/10;
  NewAmp2 = abs(eval(NAexp));
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    ClosestAc1 = pAc1 + Ac1x2/10;
  end
```

```
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    Closest = NewAmp2;
  end
end
Ac1 = ClosestAc1;
pAc1 = Ac1;
for Ac1x2 = -5:5,
  Ac1 = pAc1 + Ac1x2/100;
  NewAmp2 = abs(eval(NAexp));
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    ClosestAc1 = pAc1 + Ac1x2/100;
  end
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    Closest = NewAmp2;
  end
end
Ac1 = ClosestAc1;
pAc1 = Ac1;
for Ac1x2 = -5:5,
  Ac1 = pAc1 + Ac1x2/1000;
  NewAmp2 = abs(eval(NAexp));
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    ClosestAc1 = pAc1 + Ac1x2/1000;
  end
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    Closest = NewAmp2;
  end
end
Ac1 = ClosestAc1;
pAc1 = Ac1;
for Ac1x2 = -5:5,
  Ac1 = pAc1 + Ac1x2/10000;
  NewAmp2 = abs(eval(NAexp));
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    ClosestAc1 = pAc1 + Ac1x2/10000;
  end
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    Closest = NewAmp2;
  end
end
fprintf(fid,';\n');
fprintf(fid,';Program colpitts4w6.m - (c) 2003 Leonard Gojer\n');
fprintf(fid,';Computation of Coil Component Parameters for Draw1\n
');
fprintf(fid,';\n');
fprintf(fid,';Initial Frequency and Amplitude Change To Set Up Dra
w1\n');
fprintf(fid,';from Colpitts example in textbook\n');
```

```
fprintf(fid,'\n');
fprintf(fid,';Desired Frequency                          = ');
fprintf(fid,'%35.16f',round(f*Fc));
fprintf(fid,'\n');
fprintf(fid,';Desired Amplification                      = ');
fprintf(fid,'%35.16f',DesiredAmp);
fprintf(fid,'\n');
fprintf(fid,';Initial Result 1 Amplitude                 = ');
fprintf(fid,'%35.16f',Result1);
fprintf(fid,'\n');
fprintf(fid,';Secondary Result 2 Amplitude               = ');
fprintf(fid,'%35.16f',eval(Result2));
fprintf(fid,'\n');
fprintf(fid,';Computed Ac1\n');
fprintf(fid,';(Component Amplification Factor)           = ');
fprintf(fid,'%35.16f',Ac1);
fprintf(fid,'\n');
fprintf(fid,';Check of Amplification Factor Desired\n');
fprintf(fid,';(Result 2/Result 1)                        = ');
fprintf(fid,'%35.16f',eval(Result2/Result1));
fprintf(fid,'\n');
fprintf(fid,';\n');
fprintf(fid,'(defun c:drawblks()');
fprintf(fid,'\n');
fprintf(fid,'  (progn');
fprintf(fid,'\n');
DesiredAmp1 = DesiredAmp;
syms sacm;
sacm = size(acm);
for i1 = 1:sacm
  DesiredAmp = acm(i1)*DesiredAmp1;
  Fc =  i1*1000000000/(16983891.6318);
  Closest = 0.0;
  for Ac1 = 1:1000,
    NewAmp = abs(eval(NAexp));
    if abs(NewAmp - DesiredAmp) < abs(Closest - DesiredAmp)
      ClosestAc1 = Ac1;
    end
    if abs(NewAmp - DesiredAmp) < abs(Closest - DesiredAmp)
      Closest = NewAmp;
    end
  end
  Ac1 = ClosestAc1;
  pAc1 = Ac1;
  for Ac1x2 = -5:5,
    Ac1 = pAc1 + Ac1x2/10;
    NewAmp2 = abs(eval(NAexp));
    if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
```

```
    ClosestAc1 = pAc1 + Ac1x2/10;
  end
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    Closest = NewAmp2;
  end
end
Ac1 = ClosestAc1;
pAc1 = Ac1;
for Ac1x2 = -5:5,
  Ac1 = pAc1 + Ac1x2/100;
  NewAmp2 = abs(eval(NAexp));
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    ClosestAc1 = pAc1 + Ac1x2/100;
  end
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    Closest = NewAmp2;
  end
end
Ac1 = ClosestAc1;
pAc1 = Ac1;
for Ac1x2 = -5:5,
  Ac1 = pAc1 + Ac1x2/1000;
  NewAmp2 = abs(eval(NAexp));
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    ClosestAc1 = pAc1 + Ac1x2/1000;
  end
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    Closest = NewAmp2;
  end
end
Ac1 = ClosestAc1;
pAc1 = Ac1;
for Ac1x2 = -5:5,
  Ac1 = pAc1 + Ac1x2/10000;
  NewAmp2 = abs(eval(NAexp));
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    ClosestAc1 = pAc1 + Ac1x2/10000;
  end
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    Closest = NewAmp2;
  end
end
Ac1 = ClosestAc1;
fprintf(fid,';\n');
fprintf(fid,';Desired Frequency                    = ');
fprintf(fid,'%35.16f',round(f*Fc));
fprintf(fid,'\n');
fprintf(fid,';Desired Amplification                = ');
```

```
fprintf(fid,'%35.16f',DesiredAmp);
fprintf(fid,'\n');
fprintf(fid,';Initial Result 1 Amplitude                = ');
fprintf(fid,'%35.16f',Result1);
fprintf(fid,'\n');
fprintf(fid,';Secondary Result 2 Amplitude              = ');
fprintf(fid,'%35.16f',eval(Result2));
fprintf(fid,'\n');
fprintf(fid,';Computed Ac1\n');
fprintf(fid,';(Component Amplification Factor)          = ');
fprintf(fid,'%35.16f',Ac1);
fprintf(fid,'\n');
fprintf(fid,';Check of Amplification Factor Desired\n');
fprintf(fid,';(Result 2/Result 1)                       = ');
fprintf(fid,'%35.16f',eval(Result2/Result1));
fprintf(fid,'\n');
fprintf(fid,';Sign 1 (sign of Result 1)                 = ');
fprintf(fid,'%35.16f',sign1);
fprintf(fid,'\n');
fprintf(fid,';Sign 2 (sign of Result 2)                 = ');
fprintf(fid,'%35.16f',eval(sign2));
fprintf(fid,'\n');
fprintf(fid,';L1                                        = ');
fprintf(fid,'%35.16f',L1*Ac1);
fprintf(fid,'\n');
fprintf(fid,';C1                                        = ');
fprintf(fid,'%35.16f',eval(C1*Fcx/Ac1));
fprintf(fid,'\n');
fprintf(fid,';C2                                        = ');
fprintf(fid,'%35.16f',eval(C2*Fcx/Ac1));
fprintf(fid,'\n');
fprintf(fid,';C3                                        = ');
fprintf(fid,'%35.16f',C3/Ac1);
fprintf(fid,'\n');
fprintf(fid,';Rd                                        = ');
fprintf(fid,'%35.16f',Rd*Ac1);
fprintf(fid,'\n');
fprintf(fid,';R1                                        = ');
fprintf(fid,'%35.16f',R1*Ac1);
fprintf(fid,'\n');
fprintf(fid,';Rl1                                       = ');
fprintf(fid,'%35.16f',Rl1*Ac1);
fprintf(fid,'\n');
fprintf(fid,';\n');
fprintf(fid,';\n');
fprintf(fid,'    (setq count ');
fprintf(fid,'%22.16f',i1);
fprintf(fid,')\n');
```

```
  fprintf(fid,'    (setq DesFreq ');
  fprintf(fid,'%22.16f',round(f*Fc));
  fprintf(fid,')\n');
  fprintf(fid,'    (setq DesAmp ');
  fprintf(fid,'%22.16f',DesiredAmp);
  fprintf(fid,')\n');
  fprintf(fid,'    (setq Init1Amp ');
  fprintf(fid,'%22.16f',Result1);
  fprintf(fid,')\n');
  fprintf(fid,'    (setq Sec2Amp ');
  fprintf(fid,'%22.16f',eval(Result2));
  fprintf(fid,')\n');
  fprintf(fid,'    (setq CompAc1 ');
  fprintf(fid,'%22.16f',Ac1);
  fprintf(fid,')\n');
  fprintf(fid,'    (setq CheckAmp ');
  fprintf(fid,'%22.16f',eval(Result2/Result1));
  fprintf(fid,')\n');
  fprintf(fid,'    (setq Sign1 ');
  fprintf(fid,'%22.16f',sign1);
  fprintf(fid,')\n');
  fprintf(fid,'    (setq Sign2 ');
  fprintf(fid,'%22.16f',eval(sign2));
  fprintf(fid,')\n');
  fprintf(fid,'    (setq L1 ');
  fprintf(fid,'%22.16f',L1*Ac1);
  fprintf(fid,')\n');
  fprintf(fid,'   -(setq C1 ');
  fprintf(fid,'%22.16f',eval(C1*Fcx/Ac1));
  fprintf(fid,')\n');
  fprintf(fid,'   -(setq C2 ');
  fprintf(fid,'%22.16f',eval(C2*Fcx/Ac1));
  fprintf(fid,')\n');
  fprintf(fid,'    (setq C3 ');
  fprintf(fid,'%22.16f',C3/Ac1);
  fprintf(fid,')\n');
  fprintf(fid,'    (setq Rd ');
  fprintf(fid,'%22.16f',Rd*Ac1);
  fprintf(fid,')\n');
  fprintf(fid,'    (setq R1 ');
  fprintf(fid,'%22.16f',R1*Ac1);
  fprintf(fid,')\n');
  fprintf(fid,'    (setq Rl1 ');
  fprintf(fid,'%22.16f',Rl1*Ac1);
  fprintf(fid,')\n');
  fprintf(fid,'    (insblkd count DesFreq DesAmp Init1Amp Sec2Amp
CompAc1 CheckAmp Sign1 Sign2');
  fprintf(fid,' L1 C1 C2 C3 Rd R1 Rl1)\n');
```

```
  fprintf(fid,';\n');
 end
fprintf(fid,'  )');
fprintf(fid,'\n');
fprintf(fid,')');
fprintf(fid,'\n');
fclose(fid);
```

```
% Program to Calculate Electrical Component Values for Oscillator
System of Coil #4
syms t C1 C2 C3 L1 R1 Rs Rd Rl1 Vbias Vdd1 Vdd Vdds IDss Vss Vg I1
 I2 I3 I4 Xc1 Xc2 Xc3 Xl1 Gm f pi;
syms Amplitude;
syms Gm0 Vgs Vgoff;
syms M1 M2 B1 Result1 M3 M4 B2 Result2 sign1 sign2;
syms Fcx;
pi = 3.14159;
C1 = 0.000000000680*1000;
C2 = 0.000000000075*1000;
C3 = 0.000000000047*1000;
L1 = 0.0000013*1000;
R1 = 1000000*1000;
Rd = 6800*1000;
f = 1/(2*pi*(L1*C1*C2/(C1 + C2))^(1/2));
Rl1 = 2*pi*f*L1;
Vdd = 12*1000;
Vg = sin(2*pi*f);
Xc1 = 1/(2*pi*f*C1);
Xc2 = 1/(2*pi*f*C2);
Xc3 = 1/(2*pi*f*C3);
Xl1 = 2*pi*f*L1;
IDss = 0.003*1000;
Vgoff = 1.5*1000;
Gm0 = -2*IDss/Vgoff;
Vgs = -2*1000;
Gm = (Vgoff/(Gm0*Vgs)) + 1;
Rs = Rd - (1/Gm);
Vss = IDss*Rs;
Vdd1 = Gm*Rd*Vg;
Amplitude = 0.0039;
Vbias = 0.0039;
M1 = [(Xl1 + Xc1 + Xc2 + Rl1) (-1*Xc1) (-1*Xc2) (0.0);];
M1 = [M1; (-1*Xc1) (Xc1 + Rs) (-1*Rs) (0.0);];
M1 = [M1; (-1*Xc2) (-1*Rs) (Xc2 + Rs + Xc3) (0.0);];
M1 = [M1; (0.0) (0.0) (0.0) (R1 + Rd);];
B1 = [(Vg); (Vss); (-1*Vss + Vdds); (Vdd + Vbias);];
M2 = [B1(1) (-1*Xc1) (-1*Xc2) (0.0);];
M2 = [M2; B1(2) (Xc1 + Rs) (-1*Rs) (0.0);];
M2 = [M2; B1(3) (-1*Rs) (Xc2 + Rs + Xc3) (0.0);];
M2 = [M2; B1(4) (0.0) (0.0) (R1 + Rd);];
Result1 = abs(det(M2)/det(M1));
%
% Now, you want to design a circuit that has Fc times the freq. of
 circuit 1
% and Ac times the amp. of circuit 1
syms Fc Ac Ac1 Xc1a Xc2a Rsa;
```

```
Vg = Ac1*sin(2*pi*f*Fc);
% Xc2a is the reactance for the second capacitor adjusted for Fc a
nd Ac1
Fcx = ((2*2*pi*pi)/(Fc*Fc*f*f))*(C1*0.000000001 + C2*0.000000001)/
(C1*0.000000001*C2*0.000000001*L1);
Xc1a = 1/(2*pi*f*C1*0.000000001*Fcx);
Xc2a = 1/(2*pi*f*C2*0.000000001*Fcx);
Rsa = Rd*Ac1 - (1/Gm);
M3 = [(Xl1*Ac1 + Xc1a*Ac1 + Xc2a + Rl1*Ac1) (-1*Xc1a*Ac1) (-1*Xc2a
) (0.0);];
M3 = [M3; (-1*Xc1a*Ac1) (Xc1a*Ac1 + Rsa) (-1*Rsa) (0.0);];
M3 = [M3; (-1*Xc2a) (-1*Rsa) (Xc2a + Rsa + Xc3*Ac1) (0.0);];
M3 = [M3; (0.0) (0.0) (0.0) (R1*Ac1 + Rd*Ac1);];
B2 = [(Vg*Ac1); (IDss*Rsa); (-1*(IDss*Rsa) + Vdds*Ac1); (Vdd*Ac1 +
 Vbias*Ac1);];
M4 = [B2(1) (-1*Xc1a*Ac1) (-1*Xc2a) (0.0);];
M4 = [M4; B2(2) (Xc1a*Ac1 + Rsa) (-1*Rsa) (0.0);];
M4 = [M4; B2(3) (-1*Rsa) (Xc2a + Rsa + Xc3*Ac1) (0.0);];
M4 = [M4; B2(4) (0.0) (0.0) (R1*Ac1 + Rd*Ac1);];
Result2 = abs(det(M4)/det(M3));
sign1 = abs(det(M2)/det(M1))/(det(M2)/det(M1));
sign2 = abs(det(M4)/det(M3))/(det(M4)/det(M3));
cw8out1;
fid = fopen('f:/draw1/colpitts4w8.txt','w');
syms DesiredAmp DesiredAmp1 NewAmp NewAmp2 pAc1 Ac1x2 Closest Clos
estAc1 NAexp;
DesiredAmp = 2.564102564;
Fc = 1000000000/(16983891.6318);
Closest = 0.0;
ClosestAc1 = 0.0;
NAexp = abs(eval((Result2/sin(2*pi*f*Fc))/(Result1/sin(2*pi*f))));
for Ac1 = 1:1000,
  NewAmp = abs(eval(NAexp));
  if abs(NewAmp - DesiredAmp) < abs(Closest - DesiredAmp)
    ClosestAc1 = Ac1;
  end
  if abs(NewAmp - DesiredAmp) < abs(Closest - DesiredAmp)
    Closest = NewAmp;
  end
end
Ac1 = ClosestAc1;
pAc1 = Ac1;
for Ac1x2 = -5:5,
  Ac1 = pAc1 + Ac1x2/10;
  NewAmp2 = abs(eval(NAexp));
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    ClosestAc1 = pAc1 + Ac1x2/10;
  end
```

```
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    Closest = NewAmp2;
  end
end
Ac1 = ClosestAc1;
pAc1 = Ac1;
for Ac1x2 = -5:5,
  Ac1 = pAc1 + Ac1x2/100;
  NewAmp2 = abs(eval(NAexp));
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    ClosestAc1 = pAc1 + Ac1x2/100;
  end
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    Closest = NewAmp2;
  end
end
Ac1 = ClosestAc1;
pAc1 = Ac1;
for Ac1x2 = -5:5,
  Ac1 = pAc1 + Ac1x2/1000;
  NewAmp2 = abs(eval(NAexp));
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    ClosestAc1 = pAc1 + Ac1x2/1000;
  end
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    Closest = NewAmp2;
  end
end
Ac1 = ClosestAc1;
pAc1 = Ac1;
for Ac1x2 = -5:5,
  Ac1 = pAc1 + Ac1x2/10000;
  NewAmp2 = abs(eval(NAexp));
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    ClosestAc1 = pAc1 + Ac1x2/10000;
  end
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    Closest = NewAmp2;
  end
end
fprintf(fid,';\n');
fprintf(fid,';Program colpitts4w8.m - (c) 2003 Leonard Gojer\n');
fprintf(fid,';Computation of Coil Component Parameters for Draw1\n
');
fprintf(fid,';\n');
fprintf(fid,';Initial Frequency and Amplitude Change To Set Up Dra
w1\n');
fprintf(fid,';from Colpitts example in textbook\n');
```

```
fprintf(fid,'\n');
fprintf(fid,';Desired Frequency                              = ');
fprintf(fid,'%35.16f',round(f*Fc));
fprintf(fid,'\n');
fprintf(fid,';Desired Amplification                          = ');
fprintf(fid,'%35.16f',DesiredAmp);
fprintf(fid,'\n');
fprintf(fid,';Initial Result 1 Amplitude                     = ');
fprintf(fid,'%35.16f',Result1);
fprintf(fid,'\n');
fprintf(fid,';Secondary Result 2 Amplitude                   = ');
fprintf(fid,'%35.16f',eval(Result2));
fprintf(fid,'\n');
fprintf(fid,';Computed Ac1\n');
fprintf(fid,';(Component Amplification Factor)               = ');
fprintf(fid,'%35.16f',Ac1);
fprintf(fid,'\n');
fprintf(fid,';Check of Amplification Factor Desired\n');
fprintf(fid,';(Result 2/Result 1)                            = ');
fprintf(fid,'%35.16f',eval(Result2/Result1));
fprintf(fid,'\n');
fprintf(fid,';\n');
fprintf(fid,'(defun c:drawblks()');
fprintf(fid,'\n');
fprintf(fid,'  (progn');
fprintf(fid,'\n');
DesiredAmp1 = DesiredAmp;
syms sacm;
sacm = size(acm);
for i1 = 1:sacm
  DesiredAmp = acm(i1)*DesiredAmp1;
  Fc =  i1*1000000000/(16983891.6318);
  Closest = 0.0;
  for Ac1 = 1:1000,
    NewAmp = abs(eval(NAexp));
    if abs(NewAmp - DesiredAmp) < abs(Closest - DesiredAmp)
      ClosestAc1 = Ac1;
    end
    if abs(NewAmp - DesiredAmp) < abs(Closest - DesiredAmp)
      Closest = NewAmp;
    end
  end
  Ac1 = ClosestAc1;
  pAc1 = Ac1;
  for Ac1x2 = -5:5,
    Ac1 = pAc1 + Ac1x2/10;
    NewAmp2 = abs(eval(NAexp));
    if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
```

```
    ClosestAc1 = pAc1 + Ac1x2/10;
  end
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    Closest = NewAmp2;
  end
end
Ac1 = ClosestAc1;
pAc1 = Ac1;
for Ac1x2 = -5:5,
  Ac1 = pAc1 + Ac1x2/100;
  NewAmp2 = abs(eval(NAexp));
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    ClosestAc1 = pAc1 + Ac1x2/100;
  end
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    Closest = NewAmp2;
  end
end
Ac1 = ClosestAc1;
pAc1 = Ac1;
for Ac1x2 = -5:5,
  Ac1 = pAc1 + Ac1x2/1000;
  NewAmp2 = abs(eval(NAexp));
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    ClosestAc1 = pAc1 + Ac1x2/1000;
  end
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    Closest = NewAmp2;
  end
end
Ac1 = ClosestAc1;
pAc1 = Ac1;
for Ac1x2 = -5:5,
  Ac1 = pAc1 + Ac1x2/10000;
  NewAmp2 = abs(eval(NAexp));
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    ClosestAc1 = pAc1 + Ac1x2/10000;
  end
  if abs(NewAmp2 - DesiredAmp) < abs(Closest - DesiredAmp)
    Closest = NewAmp2;
  end
end
Ac1 = ClosestAc1;
fprintf(fid,';\n');
fprintf(fid,';Desired Frequency                    = ');
fprintf(fid,'%35.16f',round(f*Fc));
fprintf(fid,'\n');
fprintf(fid,';Desired Amplification                = ');
```

```
fprintf(fid,'%35.16f',DesiredAmp);
fprintf(fid,'\n');
fprintf(fid,';Initial Result 1 Amplitude                = ');
fprintf(fid,'%35.16f',Result1);
fprintf(fid,'\n');
fprintf(fid,';Secondary Result 2 Amplitude              = ');
fprintf(fid,'%35.16f',eval(Result2));
fprintf(fid,'\n');
fprintf(fid,';Computed Ac1\n');
fprintf(fid,';(Component Amplification Factor)          = ');
fprintf(fid,'%35.16f',Ac1);
fprintf(fid,'\n');
fprintf(fid,';Check of Amplification Factor Desired\n');
fprintf(fid,';(Result 2/Result 1)                       = ');
fprintf(fid,'%35.16f',eval(Result2/Result1));
fprintf(fid,'\n');
fprintf(fid,';Sign 1 (sign of Result 1)                 = ');
fprintf(fid,'%35.16f',sign1);
fprintf(fid,'\n');
fprintf(fid,';Sign 2 (sign of Result 2)                 = ');
fprintf(fid,'%35.16f',eval(sign2));
fprintf(fid,'\n');
fprintf(fid,';L1                                        = ');
fprintf(fid,'%35.16f',L1*Ac1);
fprintf(fid,'\n');
fprintf(fid,';C1                                        = ');
fprintf(fid,'%35.16f',eval(C1*Fcx/Ac1));
fprintf(fid,'\n');
fprintf(fid,';C2                                        = ');
fprintf(fid,'%35.16f',eval(C2*Fcx/Ac1));
fprintf(fid,'\n');
fprintf(fid,';C3                                        = ');
fprintf(fid,'%35.16f',C3/Ac1);
fprintf(fid,'\n');
fprintf(fid,';Rd                                        = ');
fprintf(fid,'%35.16f',Rd*Ac1);
fprintf(fid,'\n');
fprintf(fid,';R1                                        = ');
fprintf(fid,'%35.16f',R1*Ac1);
fprintf(fid,'\n');
fprintf(fid,';Rl1                                       = ');
fprintf(fid,'%35.16f',Rl1*Ac1);
fprintf(fid,'\n');
fprintf(fid,';\n');
fprintf(fid,';\n');
fprintf(fid,'    (setq count ');
fprintf(fid,'%22.16f',i1);
fprintf(fid,')\n');
```

```
  fprintf(fid,'    (setq DesFreq ');
  fprintf(fid,'%22.16f',round(f*Fc));
  fprintf(fid,')\n');
  fprintf(fid,'    (setq DesAmp ');
  fprintf(fid,'%22.16f',DesiredAmp);
  fprintf(fid,')\n');
  fprintf(fid,'    (setq Init1Amp ');
  fprintf(fid,'%22.16f',Result1);
  fprintf(fid,')\n');
  fprintf(fid,'    (setq Sec2Amp ');
  fprintf(fid,'%22.16f',eval(Result2));
  fprintf(fid,')\n');
  fprintf(fid,'    (setq CompAc1 ');
  fprintf(fid,'%22.16f',Ac1);
  fprintf(fid,')\n');
  fprintf(fid,'    (setq CheckAmp ');
  fprintf(fid,'%22.16f',eval(Result2/Result1));
  fprintf(fid,')\n');
  fprintf(fid,'    (setq Sign1 ');
  fprintf(fid,'%22.16f',sign1);
  fprintf(fid,')\n');
  fprintf(fid,'    (setq Sign2 ');
  fprintf(fid,'%22.16f',eval(sign2));
  fprintf(fid,')\n');
  fprintf(fid,'    (setq L1 ');
  fprintf(fid,'%22.16f',L1*Ac1);
  fprintf(fid,')\n');
  fprintf(fid,'    (setq C1 ');
  fprintf(fid,'%22.16f',eval(C1*Fcx/Ac1));
  fprintf(fid,')\n');
  fprintf(fid,'    (setq C2 ');
  fprintf(fid,'%22.16f',eval(C2*Fcx/Ac1));
  fprintf(fid,')\n');
  fprintf(fid,'    (setq C3 ');
  fprintf(fid,'%22.16f',C3/Ac1);
  fprintf(fid,')\n');
  fprintf(fid,'    (setq Rd ');
  fprintf(fid,'%22.16f',Rd*Ac1);
  fprintf(fid,')\n');
  fprintf(fid,'    (setq R1 ');
  fprintf(fid,'%22.16f',R1*Ac1);
  fprintf(fid,')\n');
  fprintf(fid,'    (setq R11 ');
  fprintf(fid,'%22.16f',R11*Ac1);
  fprintf(fid,')\n');
  fprintf(fid,'    (insblkd count DesFreq DesAmp Init1Amp Sec2Amp
CompAc1 CheckAmp Sign1 Sign2');
  fprintf(fid,' L1 C1 C2 C3 Rd R1 R11)\n');
```

```
  fprintf(fid,';\n');
 end
fprintf(fid,'  )');
fprintf(fid,'\n');
fprintf(fid,')');
fprintf(fid,'\n');
fclose(fid);
```

```
%-------------------------------------------------------------------------------
-----------------
%coilwave4.m - Program to Compute Amplitude Values for Oscillators of Coil #4 of
Magnetic Bottle
%        - Waveform is Specified by Interpolation of 200 term fourier series in
Matlab
%-------------------------------------------------------------------------------
-----------------
syms ax ay bx by cx cy dx dy ex ey fx fy;
syms gx gy hx hy ix iy jx jy kx ky lx ly;
syms mx my nx ny ox oy xof xofa yof yof2 m1 m2 dx1 dx1dy1 xvar yvar;
syms a1 b1 c1 f1 a2 b2 c2 a3 b3 c3 suml1 suml2 term1 term2;
syms a4 b4 c4 a1a b1a c1a f1a a1b b1b c1b expr1 expr2 pi;
syms a1c b1c c1c f1b f1c f2a f2b a1q b1q c1q fq asubn bsubn;
syms L k f3a f3b f4a f4b f4c x i1 i2 k1 loops iii1 foura fourb;
pi = 3.141592654;
L = 10;
k = 2;
k1 = 0.25;
m1 = 2.5;
m2 = -0.5;
ax = 0;
bx = k - k1 + ax;
cx = k + k1 + ax;
dx = L - k - k1 + ax;
ex = L - k + k1 + ax;
fx = L + k - k1 + ax;
gx = L + k + k1 + ax;
hx = 3*L - gx;
ix = 3*L - fx;
jx = 2*L;
kx = k + ax;
lx = 2*L - k + ax;
mx = L - k + ax;
nx = L + k + ax;
ox = 2*L - k;
ay = 0;
by = m1*(k - k1) + ay;
cy = m2*(k1) + m1*k + ay;
dy = m2*(L - 2*k - k1) + m1*k + ay;
ey = m2*(L - k + k1) + m1*k + ay;
fy = m2*(L + k - k1) + m1*k + ay;
gy = m2*(k + k1) + ay;
hy = gy;
iy = fy;
jy = 0;
ky = m1*k + ay;
ly = -m1*k + ay;
my = m2*(L - 2*k) + m1*k + ay;
ny = -1*(dy+ey)/2;
oy = -my;

fid = fopen('g:/draw1/coilwave4.out','w');
fprintf(fid,'Fourier Series of Coil #4 WaveForm');
fprintf(fid,'\n');
fprintf(fid,'---------------------------------');
fprintf(fid,'\n');
fprintf(fid,'\n');
dx1 = 2*L/1000;
for ii1 = 0:100
  suml1 = 0.0;
  suml2 = 0.0;
  for iii1 = 1:500
```

```
    xofa = iii1*2*L/1000;
    xof = (L/2) + xofa;
%-------------------------------------------------------------------------------
------------------
%f1

%2a1*bx + b1 = m1

%2a1*cx + b1 = m2

%c1 = -a1*bx^2 - b1*bx

%-------------------------------------------------------------------------------
------------------
    a1 = (m1 - m2)/(2*bx - 2*cx);
    b1 = (2*bx*m2 - 2*cx*m1)/(2*bx - 2*cx);
    c1 = (-1*a1)*bx*bx - b1*bx;
    f1 = a1*xof*xof + b1*xof + c1;

%-------------------------------------------------------------------------------
------------------
%f1a

%is f1 flipped

%-------------------------------------------------------------------------------
------------------
    f1a = a1*(L - xof)*(L - xof) + b1*(L - xof) + c1;

%-------------------------------------------------------------------------------
------------------
%f2a

%dy+f1a

%-------------------------------------------------------------------------------
------------------
    f2a = f1a + dy;

%-------------------------------------------------------------------------------
------------------
%f2b

%my+f1a

%-------------------------------------------------------------------------------
------------------
    f2b = f1a + my;

%-------------------------------------------------------------------------------
------------------
%f1b

%-f1 of (xof + L)

%-------------------------------------------------------------------------------
------------------
    a1b = (-m1 + m2)/(2*fx - 2*gx);
    b1b = (2*fx*(-m2) - 2*gx*(-m1))/(2*fx - 2*gx);
    c1b = (-1*a1b)*fx*fx - b1b*fx;
    f1b = a1b*xof*xof + b1b*xof + c1b;
    a1c = (m1 - m2)/(2*hx - 2*ix);
    b1c = (2*hx*(m2) - 2*ix*(m1))/(2*hx - 2*ix);
```

```
    c1c = (-1*a1c)*hx*hx - b1c*hx;

%-------------------------------------------------------------------------------
------------------
%f3a

%fy-f1b

%-------------------------------------------------------------------------------
------------------
    f3a = fy - f1b;

%-------------------------------------------------------------------------------
------------------
%f3b

%ny-f1b

%-------------------------------------------------------------------------------
------------------
    f3b = ny - f1b;

%-------------------------------------------------------------------------------
------------------
%f4c

%-f1a at 2nd point

%-------------------------------------------------------------------------------
------------------
    f4c = -a1c*(xof)*(xof) - b1c*(xof) - c1c;

%-------------------------------------------------------------------------------
------------------
%f4a

%-cy + f4c

%-------------------------------------------------------------------------------
------------------
    f4a = -f4c - cy;

%-------------------------------------------------------------------------------
------------------
%f4b

%f4c -cy

%-------------------------------------------------------------------------------
------------------
    f4b = -f4c - cy;

%-------------------------------------------------------------------------------
------------------
%returns

%x,y for x,cycle #

%-------------------------------------------------------------------------------
------------------
    if (xof < bx)
      yof = ay + m1*xof;
```

```
end
if (xof >= bx)
  if (xof < cx)
    yof = by + a1*xof*xof + b1*xof + c1;
  end
end
if (xof >= cx)
  if (xof < dx)
    yof = cy + m2*(xof - cx);
  end
end
if (xof >= dx)
  if (xof < (L - k))
    yof = f2a;
  end
end
if (xof >= (L - k))
  if (xof < ex)
    yof = f2b;
  end
end
if (xof >= ex)
  if (xof < fx)
    yof = ey + m2*(xof - ex);
  end
end
if (xof >= fx)
  if (xof < (L + k))
    yof = f3a;
  end
end
if (xof >= (L + k))
  if (xof < gx)
    yof = f3b;
  end
end
if (xof >= gx)
  if (xof < hx)
    yof = gy + m2*(xof - gx);
  end
end
if (xof >= hx)
  if (xof < ox)
    yof = f4a;
  end
end
if (xof >= ox)
  if (xof < ix)
    yof = f4b;
  end
end
if (xof >= ix)
  if (xof < jx)
    yof = -by + m1*(xof - ix);
  end
end
if (xof == jx)
  yof = 0.0;
end
term1 = cos(pi*ii1*xof/L);
term2 = sin(pi*ii1*xof/L);
yof2 = -1*yof;
dx1dy1 = dx1*yof2;
```

```
    expr1 = term1*dx1dy1;
    expr2 = term2*dx1dy1;
    sum11 = sum11 + expr1;
    sum12 = sum12 + expr2;
  end
  for iii1 = 501:1000
    xofa = iii1*2*L/1000;
    xof = xofa + (L/2);
%-------------------------------------------------------------------------------
------------------
%f1

%2a1*bx + b1 = m1

%2a1*cx + b1 = m2

%c1 = -a1*bx^2 - b1*bx

%-------------------------------------------------------------------------------
------------------
    a1 = (m1 - m2)/(2*bx - 2*cx);
    b1 = (2*bx*m2 - 2*cx*m1)/(2*bx - 2*cx);
    c1 = (-1*a1)*bx*bx - b1*bx;
    f1 = a1*xof*xof + b1*xof + c1;

%-------------------------------------------------------------------------------
------------------
%f1a

%is f1 flipped

%-------------------------------------------------------------------------------
------------------
    f1a = a1*(L - xof)*(L - xof) + b1*(L - xof) + c1;

%-------------------------------------------------------------------------------
------------------
%f2a

%dy+f1a

%-------------------------------------------------------------------------------
------------------
    f2a = f1a + dy;

%-------------------------------------------------------------------------------
------------------
%f2b

%my+f1a

%-------------------------------------------------------------------------------
------------------
    f2b = f1a + my;

%-------------------------------------------------------------------------------
------------------
%f1b

%-f1 of (xof + L)

%-------------------------------------------------------------------------------
------------------
```

```
    a1b = (-m1 + m2)/(2*fx - 2*gx);
    b1b = (2*fx*(-m2) - 2*gx*(-m1))/(2*fx - 2*gx);
    c1b = (-1*a1b)*fx*fx - b1b*fx;
    f1b = a1b*xof*xof + b1b*xof + c1b;
    a1c = (m1 - m2)/(2*hx - 2*ix);
    b1c = (2*hx*(m2) - 2*ix*(m1))/(2*hx - 2*ix);
    c1c = (-1*a1c)*hx*hx - b1c*hx;

%-------------------------------------------------------------------------------
------------------
%f3a

%fy-f1b

%-------------------------------------------------------------------------------
------------------
    f3a = fy - f1b;

%-------------------------------------------------------------------------------
------------------
%f3b

%ny-f1b

%-------------------------------------------------------------------------------
------------------
    f3b = ny - f1b;

%-------------------------------------------------------------------------------
------------------
%f4c

%-f1a at 2nd point

%-------------------------------------------------------------------------------
------------------
    f4c = -a1c*(xof)*(xof) - b1c*(xof) - c1c;

%-------------------------------------------------------------------------------
------------------
%f4a

%-cy + f4c

%-------------------------------------------------------------------------------
------------------
    f4a = -f4c - cy;

%-------------------------------------------------------------------------------
------------------
%f4b

%f4c -cy

%-------------------------------------------------------------------------------
------------------
    f4b = -f4c - cy;

%-------------------------------------------------------------------------------
------------------
%returns
```

```
%x,y for x,cycle #

%-------------------------------------------------------------------------------
------------------
    if (xof < bx)
      yof = ay + m1*xof;
    end
    if (xof >= bx)
      if (xof < cx)
        yof = by + a1*xof*xof + b1*xof + c1;
      end
    end
    if (xof >= cx)
      if (xof < dx)
        yof = cy + m2*(xof - cx);
      end
    end
    if (xof >= dx)
      if (xof < (L - k))
        yof = f2a;
      end
    end
    if (xof >= (L - k))
      if (xof < ex)
        yof = f2b;
      end
    end
    if (xof >= ex)
      if (xof < fx)
        yof = ey + m2*(xof - ex);
      end
    end
    if (xof >= fx)
      if (xof < (L + k))
        yof = f3a;
      end
    end
    if (xof >= (L + k))
      if (xof < gx)
        yof = f3b;
      end
    end
    if (xof >= gx)
      if (xof < hx)
        yof = gy + m2*(xof - gx);
      end
    end
    if (xof >= hx)
      if (xof < ox)
        yof = f4a;
      end
    end
    if (xof >= ox)
      if (xof < ix)
        yof = f4b;
      end
    end
    if (xof >= ix)
      if (xof < jx)
        yof = -by + m1*(xof - ix);
      end
    end
    if (xof == jx)
```

```
      yof = 0.0;
    end
    term1 = cos(pi*ii1*xof/L);
    term2 = sin(pi*ii1*xof/L);
    yof2 = -1*yof;
    dx1dy1 = dx1*yof2;
    expr1 = term1*dx1dy1;
    expr2 = term2*dx1dy1;
    suml1 = suml1 + expr1;
    suml2 = suml2 + expr2;
  end
  asubn = (1/L)*suml1;
  bsubn = (1/L)*suml2;
  if (ii1 == 0)
    asubn = asubn/2;
    bsubn = 0.0;
  end
  foura = asubn*cos(pi*ii1*xvar/L);
  fourb = bsubn*cos(pi*ii1*yvar/L);
  fprintf(fid,'N = ');
  fprintf(fid,'%4i',ii1);
  fprintf(fid,'\n');
  fprintf(fid,'A Term = ');
  fprintf(fid,'%24.20f',asubn);
  fprintf(fid,'*');
  fprintf(fid,'cos(');
  fprintf(fid,'%8.7f',pi);
  fprintf(fid,'*');
  fprintf(fid,'%1i',ii1);
  fprintf(fid,'*x/');
  fprintf(fid,'%9.8f',L);
  fprintf(fid,')\n');
  fprintf(fid,'B Term = ');
  fprintf(fid,'%24.20f',bsubn);
  fprintf(fid,'*');
  fprintf(fid,'sin(');
  fprintf(fid,'%8.7f',pi);
  fprintf(fid,'*');
  fprintf(fid,'%1i',ii1);
  fprintf(fid,'*x/');
  fprintf(fid,'%9.8f',L);
  fprintf(fid,')\n');
  fprintf(fid,'\n');
end
fclose(fid);
```

```
%-------------------------------------------------------------------------------
-----------------
%coilwave3.m - Program to Compute Amplitude Values for Oscillators of Coil #3 of
Magnetic Bottle
%        - Waveform is Specified by Interpolation of 200 term fourier series in
Matlab
%-------------------------------------------------------------------------------
-----------------
syms ax ay bx by cx cy dx dy ex ey fx fy;
syms gx gy hx hy ix iy jx jy kx ky lx ly;
syms mx my nx ny ox oy xof xofa yof yof2 m1 m2 dx1 dx1dy1 xvar yvar;
syms a1 b1 c1 f1 a2 b2 c2 a3 b3 c3 suml1 suml2 term1 term2;
syms a4 b4 c4 a1a b1a c1a f1a a1b b1b c1b expr1 expr2 pi;
syms a1c b1c c1c f1b f1c f2a f2b a1q b1q c1q fq asubn bsubn;
syms L k f3a f3b f4a f4b f4c x i1 i2 k1 loops iii1 foura fourb;
pi = 3.141592654;
L = 10;
k = 2;
k1 = 0.25;
m1 = 2.5;
m2 = -0.5;
ax = 0;
bx = k - k1 + ax;
cx = k + k1 + ax;
dx = L - k - k1 + ax;
ex = L - k + k1 + ax;
fx = L + k - k1 + ax;
gx = L + k + k1 + ax;
hx = 3*L - gx;
ix = 3*L - fx;
jx = 2*L;
kx = k + ax;
lx = 2*L - k + ax;
mx = L - k + ax;
nx = L + k + ax;
ox = 2*L - k;
ay = 0;
by = m1*(k - k1) + ay;
cy = m2*(k1) + m1*k + ay;
dy = m2*(L - 2*k - k1) + m1*k + ay;
ey = m2*(L - k + k1) + m1*k + ay;
fy = m2*(L + k - k1) + m1*k + ay;
gy = m2*(k + k1) + ay;
hy = gy;
iy = fy;
jy = 0;
ky = m1*k + ay;
ly = -m1*k + ay;
my = m2*(L - 2*k) + m1*k + ay;
ny = -1*(dy+ey)/2;
oy = -my;

fid = fopen('g:/draw1/coilwave3.out','w');
fprintf(fid,'Fourier Series of Coil #3 WaveForm');
fprintf(fid,'\n');
fprintf(fid,'---------------------------------');
fprintf(fid,'\n');
fprintf(fid,'\n');
dx1 = 2*L/1000;
for ii1 = 0:100
  suml1 = 0.0;
  suml2 = 0.0;
  for iii1 = 1:500
```

```
    xofa = iii1*2*L/1000;
    xof = 2*L - xofa;
%-------------------------------------------------------------------------------
------------------
%f1

%2a1*bx + b1 = m1

%2a1*cx + b1 = m2

%c1 = -a1*bx^2 - b1*bx

%-------------------------------------------------------------------------------
------------------
    a1 = (m1 - m2)/(2*bx - 2*cx);
    b1 = (2*bx*m2 - 2*cx*m1)/(2*bx - 2*cx);
    c1 = (-1*a1)*bx*bx - b1*bx;
    f1 = a1*xof*xof + b1*xof + c1;

%-------------------------------------------------------------------------------
------------------
%f1a

%is f1 flipped

%-------------------------------------------------------------------------------
------------------
    f1a = a1*(L - xof)*(L - xof) + b1*(L - xof) + c1;

%-------------------------------------------------------------------------------
------------------
%f2a

%dy+f1a

%-------------------------------------------------------------------------------
------------------
    f2a = f1a + dy;

%-------------------------------------------------------------------------------
------------------
%f2b

%my+f1a

%-------------------------------------------------------------------------------
------------------
    f2b = f1a + my;

%-------------------------------------------------------------------------------
------------------
%f1b

%-f1 of (xof + L)

%-------------------------------------------------------------------------------
------------------
    a1b = (-m1 + m2)/(2*fx - 2*gx);
    b1b = (2*fx*(-m2) - 2*gx*(-m1))/(2*fx - 2*gx);
    c1b = (-1*a1b)*fx*fx - b1b*fx;
    f1b = a1b*xof*xof + b1b*xof + c1b;
    a1c = (m1 - m2)/(2*hx - 2*ix);
    b1c = (2*hx*(m2) - 2*ix*(m1))/(2*hx - 2*ix);
```

```
    c1c = (-1*a1c)*hx*hx - b1c*hx;

%-------------------------------------------------------------------------------
------------------
%f3a

%fy-f1b

%-------------------------------------------------------------------------------
------------------
    f3a = fy - f1b;

%-------------------------------------------------------------------------------
------------------
%f3b

%ny-f1b

%-------------------------------------------------------------------------------
------------------
    f3b = ny - f1b;

%-------------------------------------------------------------------------------
------------------
%f4c

%-f1a at 2nd point

%-------------------------------------------------------------------------------
------------------
    f4c = -a1c*(xof)*(xof) - b1c*(xof) - c1c;

%-------------------------------------------------------------------------------
------------------
%f4a

%-cy + f4c

%-------------------------------------------------------------------------------
------------------
    f4a = -f4c - cy;

%-------------------------------------------------------------------------------
------------------
%f4b

%f4c -cy

%-------------------------------------------------------------------------------
------------------
    f4b = -f4c - cy;

%-------------------------------------------------------------------------------
------------------
%returns

%x,y for x,cycle #

%-------------------------------------------------------------------------------
------------------
    if (xof < bx)
      yof = ay + m1*xof;
```

```
end
if (xof >= bx)
  if (xof < cx)
    yof = by + a1*xof*xof + b1*xof + c1;
  end
end
if (xof >= cx)
  if (xof < dx)
    yof = cy + m2*(xof - cx);
  end
end
if (xof >= dx)
  if (xof < (L - k))
    yof = f2a;
  end
end
if (xof >= (L - k))
  if (xof < ex)
    yof = f2b;
  end
end
if (xof >= ex)
  if (xof < fx)
    yof = ey + m2*(xof - ex);
  end
end
if (xof >= fx)
  if (xof < (L + k))
    yof = f3a;
  end
end
if (xof >= (L + k))
  if (xof < gx)
    yof = f3b;
  end
end
if (xof >= gx)
  if (xof < hx)
    yof = gy + m2*(xof - gx);
  end
end
if (xof >= hx)
  if (xof < ox)
    yof = f4a;
  end
end
if (xof >= ox)
  if (xof < ix)
    yof = f4b;
  end
end
if (xof >= ix)
  if (xof < jx)
    yof = -by + m1*(xof - ix);
  end
end
if (xof == jx)
  yof = 0.0;
end
term1 = cos(pi*ii1*xof/L);
term2 = sin(pi*ii1*xof/L);
dx1dy1 = dx1*yof;
expr1 = term1*dx1dy1;
```

```
    expr2 = term2*dx1dy1;
    suml1 = suml1 + expr1;
    suml2 = suml2 + expr2;
  end
  for iii1 = 501:1000
    xofa = iii1*2*L/1000;
    xof = xofa - 2*L;
%-------------------------------------------------------------------------------
------------------
%f1

%2a1*bx + b1 = m1

%2a1*cx + b1 = m2

%c1 = -a1*bx^2 - b1*bx

%-------------------------------------------------------------------------------
------------------
    a1 = (m1 - m2)/(2*bx - 2*cx);
    b1 = (2*bx*m2 - 2*cx*m1)/(2*bx - 2*cx);
    c1 = (-1*a1)*bx*bx - b1*bx;
    f1 = a1*xof*xof + b1*xof + c1;

%-------------------------------------------------------------------------------
------------------
%f1a

%is f1 flipped

%-------------------------------------------------------------------------------
------------------
    f1a = a1*(L - xof)*(L - xof) + b1*(L - xof) + c1;

%-------------------------------------------------------------------------------
------------------
%f2a

%dy+f1a

%-------------------------------------------------------------------------------
------------------
    f2a = f1a + dy;

%-------------------------------------------------------------------------------
------------------
%f2b

%my+f1a

%-------------------------------------------------------------------------------
------------------
    f2b = f1a + my;

%-------------------------------------------------------------------------------
------------------
%f1b

%-f1 of (xof + L)

%-------------------------------------------------------------------------------
------------------
    a1b = (-m1 + m2)/(2*fx - 2*gx);
```

```
    b1b = (2*fx*(-m2) - 2*gx*(-m1))/(2*fx - 2*gx);
    c1b = (-1*a1b)*fx*fx - b1b*fx;
    f1b = a1b*xof*xof + b1b*xof + c1b;
    a1c = (m1 - m2)/(2*hx - 2*ix);
    b1c = (2*hx*(m2) - 2*ix*(m1))/(2*hx - 2*ix);
    c1c = (-1*a1c)*hx*hx - b1c*hx;


%-------------------------------------------------------------------------------
------------------
%f3a

%fy-f1b

%-------------------------------------------------------------------------------
------------------
    f3a = fy - f1b;

%-------------------------------------------------------------------------------
------------------
%f3b

%ny-f1b

%-------------------------------------------------------------------------------
------------------
    f3b = ny - f1b;

%-------------------------------------------------------------------------------
------------------
%f4c

%-f1a at 2nd point

%-------------------------------------------------------------------------------
------------------
    f4c = -a1c*(xof)*(xof) - b1c*(xof) - c1c;

%-------------------------------------------------------------------------------
------------------
%f4a

%-cy + f4c

%-------------------------------------------------------------------------------
------------------
    f4a = -f4c - cy;

%-------------------------------------------------------------------------------
------------------
%f4b

%f4c -cy

%-------------------------------------------------------------------------------
------------------
    f4b = -f4c - cy;

%-------------------------------------------------------------------------------
------------------
%returns

%x,y for x,cycle #
```

```
%-------------------------------------------------------------------------------
-----------------
    if (xof < bx)
      yof = ay + m1*xof;
    end
    if (xof >= bx)
      if (xof < cx)
        yof = by + a1*xof*xof + b1*xof + c1;
      end
    end
    if (xof >= cx)
      if (xof < dx)
        yof = cy + m2*(xof - cx);
      end
    end
    if (xof >= dx)
      if (xof < (L - k))
        yof = f2a;
      end
    end
    if (xof >= (L - k))
      if (xof < ex)
        yof = f2b;
      end
    end
    if (xof >= ex)
      if (xof < fx)
        yof = ey + m2*(xof - ex);
      end
    end
    if (xof >= fx)
      if (xof < (L + k))
        yof = f3a;
      end
    end
    if (xof >= (L + k))
      if (xof < gx)
        yof = f3b;
      end
    end
    if (xof >= gx)
      if (xof < hx)
        yof = gy + m2*(xof - gx);
      end
    end
    if (xof >= hx)
      if (xof < ox)
        yof = f4a;
      end
    end
    if (xof >= ox)
      if (xof < ix)
        yof = f4b;
      end
    end
    if (xof >= ix)
      if (xof < jx)
        yof = -by + m1*(xof - ix);
      end
    end
    if (xof == jx)
      yof = 0.0;
```

```
    end
    term1 = cos(pi*ii1*xof/L);
    term2 = sin(pi*ii1*xof/L);
    yof2 = 1*yof;
    dx1dy1 = dx1*yof2;
    expr1 = term1*dx1dy1;
    expr2 = term2*dx1dy1;
    suml1 = suml1 + expr1;
    suml2 = suml2 + expr2;
  end
  asubn = (1/L)*suml1;
  bsubn = (1/L)*suml2;
  if (ii1 == 0)
    asubn = asubn/2;
    bsubn = 0.0;
  end
  foura = asubn*cos(pi*ii1*xvar/L);
  fourb = bsubn*cos(pi*ii1*yvar/L);
  fprintf(fid,'N = ');
  fprintf(fid,'%4i',ii1);
  fprintf(fid,'\n');
  fprintf(fid,'A Term = ');
  fprintf(fid,'%24.20f',asubn);
  fprintf(fid,'*');
  fprintf(fid,'cos(');
  fprintf(fid,'%8.7f',pi);
  fprintf(fid,'*');
  fprintf(fid,'%1i',ii1);
  fprintf(fid,'*x/');
  fprintf(fid,'%9.8f',L);
  fprintf(fid,')\n');
  fprintf(fid,'B Term = ');
  fprintf(fid,'%24.20f',bsubn);
  fprintf(fid,'*');
  fprintf(fid,'sin(');
  fprintf(fid,'%8.7f',pi);
  fprintf(fid,'*');
  fprintf(fid,'%1i',ii1);
  fprintf(fid,'*x/');
  fprintf(fid,'%9.8f',L);
  fprintf(fid,')\n');
  fprintf(fid,'\n');
end
fclose(fid);
```

```
%-------------------------------------------------------------------------------
-----------------
%coilwave2.m - Program to Compute Amplitude Values for Oscillators of Coil #2 of
Magnetic Bottle
%        - Waveform is Specified by Interpolation of 200 term fourier series in
Matlab
%-------------------------------------------------------------------------------
-----------------
syms ax ay bx by cx cy dx dy ex ey fx fy;
syms gx gy hx hy ix iy jx jy kx ky lx ly;
syms mx my nx ny ox oy xof xofa yof yof2 m1 m2 dx1 dx1dy1 xvar yvar;
syms a1 b1 c1 f1 a2 b2 c2 a3 b3 c3 suml1 suml2 term1 term2;
syms a4 b4 c4 a1a b1a c1a f1a a1b b1b c1b expr1 expr2 pi;
syms a1c b1c c1c f1b f1c f2a f2b a1q b1q c1q fq asubn bsubn;
syms L k f3a f3b f4a f4b f4c x i1 i2 k1 loops iii1 foura fourb;
pi = 3.141592654;
L = 10;
k = 2;
k1 = 0.25;
m1 = 2.5;
m2 = -0.5;
ax = 0;
bx = k - k1 + ax;
cx = k + k1 + ax;
dx = L - k - k1 + ax;
ex = L - k + k1 + ax;
fx = L + k - k1 + ax;
gx = L + k + k1 + ax;
hx = 3*L - gx;
ix = 3*L - fx;
jx = 2*L;
kx = k + ax;
lx = 2*L - k + ax;
mx = L - k + ax;
nx = L + k + ax;
ox = 2*L - k;
ay = 0;
by = m1*(k - k1) + ay;
cy = m2*(k1) + m1*k + ay;
dy = m2*(L - 2*k - k1) + m1*k + ay;
ey = m2*(L - k + k1) + m1*k + ay;
fy = m2*(L + k - k1) + m1*k + ay;
gy = m2*(k + k1) + ay;
hy = gy;
iy = fy;
jy = 0;
ky = m1*k + ay;
ly = -m1*k + ay;
my = m2*(L - 2*k) + m1*k + ay;
ny = -1*(dy+ey)/2;
oy = -my;

fid = fopen('g:/draw1/coilwave2.out','w');
fprintf(fid,'Fourier Series of Coil #2 WaveForm');
fprintf(fid,'\n');
fprintf(fid,'---------------------------------');
fprintf(fid,'\n');
fprintf(fid,'\n');
dx1 = 2*L/1000;
for ii1 = 0:100
  suml1 = 0.0;
  suml2 = 0.0;
  for iii1 = 1:500
```

```
    xofa = iii1*2*L/1000;
    xof = L - xofa;
%-------------------------------------------------------------------------------
------------------
%f1

%2a1*bx + b1 = m1

%2a1*cx + b1 = m2

%c1 = -a1*bx^2 - b1*bx

%-------------------------------------------------------------------------------
------------------
    a1 = (m1 - m2)/(2*bx - 2*cx);
    b1 = (2*bx*m2 - 2*cx*m1)/(2*bx - 2*cx);
    c1 = (-1*a1)*bx*bx - b1*bx;
    f1 = a1*xof*xof + b1*xof + c1;

%-------------------------------------------------------------------------------
------------------
%f1a

%is f1 flipped

%-------------------------------------------------------------------------------
------------------
    f1a = a1*(L - xof)*(L - xof) + b1*(L - xof) + c1;

%-------------------------------------------------------------------------------
------------------
%f2a

%dy+f1a

%-------------------------------------------------------------------------------
------------------
    f2a = f1a + dy;

%-------------------------------------------------------------------------------
------------------
%f2b

%my+f1a

%-------------------------------------------------------------------------------
------------------
    f2b = f1a + my;

%-------------------------------------------------------------------------------
------------------
%f1b

%-f1 of (xof + L)

%-------------------------------------------------------------------------------
------------------
    a1b = (-m1 + m2)/(2*fx - 2*gx);
    b1b = (2*fx*(-m2) - 2*gx*(-m1))/(2*fx - 2*gx);
    c1b = (-1*a1b)*fx*fx - b1b*fx;
    f1b = a1b*xof*xof + b1b*xof + c1b;
    a1c = (m1 - m2)/(2*hx - 2*ix);
    b1c = (2*hx*(m2) - 2*ix*(m1))/(2*hx - 2*ix);
```

```
    c1c = (-1*a1c)*hx*hx - b1c*hx;

%-------------------------------------------------------------------------------
------------------
%f3a

%fy-f1b

%-------------------------------------------------------------------------------
------------------
    f3a = fy - f1b;

%-------------------------------------------------------------------------------
------------------
%f3b

%ny-f1b

%-------------------------------------------------------------------------------
------------------
    f3b = ny - f1b;

%-------------------------------------------------------------------------------
------------------
%f4c

%-f1a at 2nd point

%-------------------------------------------------------------------------------
------------------
    f4c = -a1c*(xof)*(xof) - b1c*(xof) - c1c;

%-------------------------------------------------------------------------------
------------------
%f4a

%-cy + f4c

%-------------------------------------------------------------------------------
------------------
    f4a = -f4c - cy;

%-------------------------------------------------------------------------------
------------------
%f4b

%f4c -cy

%-------------------------------------------------------------------------------
------------------
    f4b = -f4c - cy;

%-------------------------------------------------------------------------------
------------------
%returns

%x,y for x,cycle #

%-------------------------------------------------------------------------------
------------------
    if (xof < bx)
      yof = ay + m1*xof;
```

```
end
if (xof >= bx)
  if (xof < cx)
    yof = by + a1*xof*xof + b1*xof + c1;
  end
end
if (xof >= cx)
  if (xof < dx)
    yof = cy + m2*(xof - cx);
  end
end
if (xof >= dx)
  if (xof < (L - k))
    yof = f2a;
  end
end
if (xof >= (L - k))
  if (xof < ex)
    yof = f2b;
  end
end
if (xof >= ex)
  if (xof < fx)
    yof = ey + m2*(xof - ex);
  end
end
if (xof >= fx)
  if (xof < (L + k))
    yof = f3a;
  end
end
if (xof >= (L + k))
  if (xof < gx)
    yof = f3b;
  end
end
if (xof >= gx)
  if (xof < hx)
    yof = gy + m2*(xof - gx);
  end
end
if (xof >= hx)
  if (xof < ox)
    yof = f4a;
  end
end
if (xof >= ox)
  if (xof < ix)
    yof = f4b;
  end
end
if (xof >= ix)
  if (xof < jx)
    yof = -by + m1*(xof - ix);
  end
end
if (xof == jx)
  yof = 0.0;
end
term1 = cos(pi*ii1*xof/L);
term2 = sin(pi*ii1*xof/L);
yof2 = -1*yof;
dx1dy1 = dx1*yof2;
```

```
    expr1 = term1*dx1dy1;
    expr2 = term2*dx1dy1;
    sum11 = sum11 + expr1;
    sum12 = sum12 + expr2;
  end
  for iii1 = 501:1000
    xofa = iii1*2*L/1000;
    xof = xofa - L;
%-------------------------------------------------------------------------------
------------------
%f1

%2a1*bx + b1 = m1

%2a1*cx + b1 = m2

%c1 = -a1*bx^2 - b1*bx

%-------------------------------------------------------------------------------
------------------
    a1 = (m1 - m2)/(2*bx - 2*cx);
    b1 = (2*bx*m2 - 2*cx*m1)/(2*bx - 2*cx);
    c1 = (-1*a1)*bx*bx - b1*bx;
    f1 = a1*xof*xof + b1*xof + c1;

%-------------------------------------------------------------------------------
------------------
%f1a

%is f1 flipped

%-------------------------------------------------------------------------------
------------------
    f1a = a1*(L - xof)*(L - xof) + b1*(L - xof) + c1;

%-------------------------------------------------------------------------------
------------------
%f2a

%dy+f1a

%-------------------------------------------------------------------------------
------------------
    f2a = f1a + dy;

%-------------------------------------------------------------------------------
------------------
%f2b

%my+f1a

%-------------------------------------------------------------------------------
------------------
    f2b = f1a + my;

%-------------------------------------------------------------------------------
------------------
%f1b

%-f1 of (xof + L)

%-------------------------------------------------------------------------------
------------------
```

```
    a1b = (-m1 + m2)/(2*fx - 2*gx);
    b1b = (2*fx*(-m2) - 2*gx*(-m1))/(2*fx - 2*gx);
    c1b = (-1*a1b)*fx*fx - b1b*fx;
    f1b = a1b*xof*xof + b1b*xof + c1b;
    a1c = (m1 - m2)/(2*hx - 2*ix);
    b1c = (2*hx*(m2) - 2*ix*(m1))/(2*hx - 2*ix);
    c1c = (-1*a1c)*hx*hx - b1c*hx;

%-------------------------------------------------------------------------------
------------------
%f3a

%fy-f1b

%-------------------------------------------------------------------------------
------------------
    f3a = fy - f1b;

%-------------------------------------------------------------------------------
------------------
%f3b

%ny-f1b

%-------------------------------------------------------------------------------
------------------
    f3b = ny - f1b;

%-------------------------------------------------------------------------------
------------------
%f4c

%-f1a at 2nd point

%-------------------------------------------------------------------------------
------------------
    f4c = -a1c*(xof)*(xof) - b1c*(xof) - c1c;

%-------------------------------------------------------------------------------
------------------
%f4a

%-cy + f4c

%-------------------------------------------------------------------------------
------------------
    f4a = -f4c - cy;

%-------------------------------------------------------------------------------
------------------
%f4b

%f4c -cy

%-------------------------------------------------------------------------------
------------------
    f4b = -f4c - cy;

%-------------------------------------------------------------------------------
------------------
%returns
```

```
%x,y for x,cycle #

%-------------------------------------------------------------------------------
------------------
    if (xof < bx)
      yof = ay + m1*xof;
    end
    if (xof >= bx)
      if (xof < cx)
        yof = by + a1*xof*xof + b1*xof + c1;
      end
    end
    if (xof >= cx)
      if (xof < dx)
        yof = cy + m2*(xof - cx);
      end
    end
    if (xof >= dx)
      if (xof < (L - k))
        yof = f2a;
      end
    end
    if (xof >= (L - k))
      if (xof < ex)
        yof = f2b;
      end
    end
    if (xof >= ex)
      if (xof < fx)
        yof = ey + m2*(xof - ex);
      end
    end
    if (xof >= fx)
      if (xof < (L + k))
        yof = f3a;
      end
    end
    if (xof >= (L + k))
      if (xof < gx)
        yof = f3b;
      end
    end
    if (xof >= gx)
      if (xof < hx)
        yof = gy + m2*(xof - gx);
      end
    end
    if (xof >= hx)
      if (xof < ox)
        yof = f4a;
      end
    end
    if (xof >= ox)
      if (xof < ix)
        yof = f4b;
      end
    end
    if (xof >= ix)
      if (xof < jx)
        yof = -by + m1*(xof - ix);
      end
    end
    if (xof == jx)
```

```
%x,y for x,cycle #

%-------------------------------------------------------------------------------
------------------
    if (xof < bx)
      yof = ay + m1*xof;
    end
    if (xof >= bx)
      if (xof < cx)
        yof = by + a1*xof*xof + b1*xof + c1;
      end
    end
    if (xof >= cx)
      if (xof < dx)
        yof = cy + m2*(xof - cx);
      end
    end
    if (xof >= dx)
      if (xof < (L - k))
        yof = f2a;
      end
    end
    if (xof >= (L - k))
      if (xof < ex)
        yof = f2b;
      end
    end
    if (xof >= ex)
      if (xof < fx)
        yof = ey + m2*(xof - ex);
      end
    end
    if (xof >= fx)
      if (xof < (L + k))
        yof = f3a;
      end
    end
    if (xof >= (L + k))
      if (xof < gx)
        yof = f3b;
      end
    end
    if (xof >= gx)
      if (xof < hx)
        yof = gy + m2*(xof - gx);
      end
    end
    if (xof >= hx)
      if (xof < ox)
        yof = f4a;
      end
    end
    if (xof >= ox)
      if (xof < ix)
        yof = f4b;
      end
    end
    if (xof >= ix)
      if (xof < jx)
        yof = -by + m1*(xof - ix);
      end
    end
    if (xof == jx)
```

```
      yof = 0.0;
    end
    term1 = cos(pi*ii1*xof/L);
    term2 = sin(pi*ii1*xof/L);
    yof2 = -1*yof;
    dx1dy1 = dx1*yof2;
    expr1 = term1*dx1dy1;
    expr2 = term2*dx1dy1;
    suml1 = suml1 + expr1;
    suml2 = suml2 + expr2;
  end
  asubn = (1/L)*suml1;
  bsubn = (1/L)*suml2;
  if (ii1 == 0)
    asubn = asubn/2;
    bsubn = 0.0;
  end
  foura = asubn*cos(pi*ii1*xvar/L);
  fourb = bsubn*cos(pi*ii1*yvar/L);
  fprintf(fid,'N = ');
  fprintf(fid,'%4i',ii1);
  fprintf(fid,'\n');
  fprintf(fid,'A Term = ');
  fprintf(fid,'%24.20f',asubn);
  fprintf(fid,'*');
  fprintf(fid,'cos(');
  fprintf(fid,'%8.7f',pi);
  fprintf(fid,'*');
  fprintf(fid,'%1i',ii1);
  fprintf(fid,'*x/');
  fprintf(fid,'%9.8f',L);
  fprintf(fid,')\n');
  fprintf(fid,'B Term = ');
  fprintf(fid,'%24.20f',bsubn);
  fprintf(fid,'*');
  fprintf(fid,'sin(');
  fprintf(fid,'%8.7f',pi);
  fprintf(fid,'*');
  fprintf(fid,'%1i',ii1);
  fprintf(fid,'*x/');
  fprintf(fid,'%9.8f',L);
  fprintf(fid,')\n');
  fprintf(fid,'\n');
end
fclose(fid);
```

```
%-------------------------------------------------------------------------------
-----------------
%coilwave1.m - Program to Compute Amplitude Values for Oscillators of Coil #1 of
Magnetic Bottle
%        - Waveform is Specified by Interpolation of 200 term fourier series in
Matlab
%-------------------------------------------------------------------------------
-----------------
syms ax ay bx by cx cy dx dy ex ey fx fy;
syms gx gy hx hy ix iy jx jy kx ky lx ly;
syms mx my nx ny ox oy xof yof m1 m2 dx1 dx1dy1 xvar yvar;
syms a1 b1 c1 f1 a2 b2 c2 a3 b3 c3 suml1 suml2 term1 term2;
syms a4 b4 c4 a1a b1a c1a f1a a1b b1b c1b expr1 expr2 pi;
syms a1c b1c c1c f1b f1c f2a f2b a1q b1q c1q fq asubn bsubn;
syms L k f3a f3b f4a f4b f4c x i1 i2 k1 loops iii1 foura fourb;
pi = 3.141592654;
L = 10;
k = 2;
k1 = 0.25;
m1 = 2.5;
m2 = -0.5;
ax = 0;
bx = k - k1 + ax;
cx = k + k1 + ax;
dx = L - k - k1 + ax;
ex = L - k + k1 + ax;
fx = L + k - k1 + ax;
gx = L + k + k1 + ax;
hx = 3*L - gx;
ix = 3*L - fx;
jx = 2*L;
kx = k + ax;
lx = 2*L - k + ax;
mx = L - k + ax;
nx = L + k + ax;
ox = 2*L - k;
ay = 0;
by = m1*(k - k1) + ay;
cy = m2*(k1) + m1*k + ay;
dy = m2*(L - 2*k - k1) + m1*k + ay;
ey = m2*(L - k + k1) + m1*k + ay;
fy = m2*(L + k - k1) + m1*k + ay;
gy = m2*(k + k1) + ay;
hy = gy;
iy = fy;
jy = 0;
ky = m1*k + ay;
ly = -m1*k + ay;
my = m2*(L - 2*k) + m1*k + ay;
ny = -1*(dy+ey)/2;
oy = -my;

fid = fopen('g:/draw1/coilwave1.out','w');
fprintf(fid,'Fourier Series of Coil #1 WaveForm');
fprintf(fid,'\n');
fprintf(fid,'---------------------------------');
fprintf(fid,'\n');
fprintf(fid,'\n');
dx1 = 2*L/1000;
for ii1 = 0:100
  suml1 = 0.0;
  suml2 = 0.0;
  for iii1 = 1:1000
```

```
    xof = iii1*2*L/1000;
%-------------------------------------------------------------------------------
------------------
%f1

%2a1*bx + b1 = m1

%2a1*cx + b1 = m2

%c1 = -a1*bx^2 - b1*bx

%-------------------------------------------------------------------------------
------------------
    a1 = (m1 - m2)/(2*bx - 2*cx);
    b1 = (2*bx*m2 - 2*cx*m1)/(2*bx - 2*cx);
    c1 = (-1*a1)*bx*bx - b1*bx;
    f1 = a1*xof*xof + b1*xof + c1;

%-------------------------------------------------------------------------------
------------------
%f1a

%is f1 flipped

%-------------------------------------------------------------------------------
------------------
    f1a = a1*(L - xof)*(L - xof) + b1*(L - xof) + c1;

%-------------------------------------------------------------------------------
------------------
%f2a

%dy+f1a

%-------------------------------------------------------------------------------
------------------
    f2a = f1a + dy;

%-------------------------------------------------------------------------------
------------------
%f2b

%my+f1a

%-------------------------------------------------------------------------------
------------------
    f2b = f1a + my;

%-------------------------------------------------------------------------------
------------------
%f1b

%-f1 of (xof + L)

%-------------------------------------------------------------------------------
------------------
    a1b = (-m1 + m2)/(2*fx - 2*gx);
    b1b = (2*fx*(-m2) - 2*gx*(-m1))/(2*fx - 2*gx);
    c1b = (-1*a1b)*fx*fx - b1b*fx;
    f1b = a1b*xof*xof + b1b*xof + c1b;
    a1c = (m1 - m2)/(2*hx - 2*ix);
    b1c = (2*hx*(m2) - 2*ix*(m1))/(2*hx - 2*ix);
    c1c = (-1*a1c)*hx*hx - b1c*hx;
```

```
%-------------------------------------------------------------------------------
------------------
%f3a

%fy-f1b

%-------------------------------------------------------------------------------
------------------
    f3a = fy - f1b;

%-------------------------------------------------------------------------------
------------------
%f3b

%ny-f1b

%-------------------------------------------------------------------------------
------------------
    f3b = ny - f1b;

%-------------------------------------------------------------------------------
------------------
%f4c

%-f1a at 2nd point

%-------------------------------------------------------------------------------
------------------
    f4c = -a1c*(xof)*(xof) - b1c*(xof) - c1c;

%-------------------------------------------------------------------------------
------------------
%f4a

%-cy + f4c

%-------------------------------------------------------------------------------
------------------
    f4a = -f4c - cy;

%-------------------------------------------------------------------------------
------------------
%f4b

%f4c -cy

%-------------------------------------------------------------------------------
------------------
    f4b = -f4c - cy;

%-------------------------------------------------------------------------------
------------------
%returns

%x,y for x,cycle #

%-------------------------------------------------------------------------------
------------------
    if (xof < bx)
      yof = ay + m1*xof;
    end
```

```
if (xof >= bx)
  if (xof < cx)
    yof = by + a1*xof*xof + b1*xof + c1;
  end
end
if (xof >= cx)
  if (xof < dx)
    yof = cy + m2*(xof - cx);
  end
end
if (xof >= dx)
  if (xof < (L - k))
    yof = f2a;
  end
end
if (xof >= (L - k))
  if (xof < ex)
    yof = f2b;
  end
end
if (xof >= ex)
  if (xof < fx)
    yof = ey + m2*(xof - ex);
  end
end
if (xof >= fx)
  if (xof < (L + k))
    yof = f3a;
  end
end
if (xof >= (L + k))
  if (xof < gx)
    yof = f3b;
  end
end
if (xof >= gx)
  if (xof < hx)
    yof = gy + m2*(xof - gx);
  end
end
if (xof >= hx)
  if (xof < ox)
    yof = f4a;
  end
end
if (xof >= ox)
  if (xof < ix)
    yof = f4b;
  end
end
if (xof >= ix)
  if (xof < jx)
    yof = -by + m1*(xof - ix);
  end
end
if (xof == jx)
  yof = 0.0;
end
term1 = cos(pi*ii1*xof/L);
term2 = sin(pi*ii1*xof/L);
dx1dy1 = dx1*yof;
expr1 = term1*dx1dy1;
expr2 = term2*dx1dy1;
```

```
    suml1 = suml1 + expr1;
    suml2 = suml2 + expr2;
  end
  asubn = (1/L)*suml1;
  bsubn = (1/L)*suml2;
  if (ii1 == 0)
    asubn = asubn/2;
    bsubn = 0.0;
  end
  foura = asubn*cos(pi*ii1*xvar/L);
  fourb = bsubn*cos(pi*ii1*yvar/L);
  fprintf(fid,'N = ');
  fprintf(fid,'%4i',ii1);
  fprintf(fid,'\n');
  fprintf(fid,'A Term = ');
  fprintf(fid,'%24.20f',asubn);
  fprintf(fid,'*');
  fprintf(fid,'cos(');
  fprintf(fid,'%8.7f',pi);
  fprintf(fid,'*');
  fprintf(fid,'%1i',ii1);
  fprintf(fid,'*x/');
  fprintf(fid,'%9.8f',L);
  fprintf(fid,')\n');
  fprintf(fid,'B Term = ');
  fprintf(fid,'%24.20f',bsubn);
  fprintf(fid,'*');
  fprintf(fid,'sin(');
  fprintf(fid,'%8.7f',pi);
  fprintf(fid,'*');
  fprintf(fid,'%1i',ii1);
  fprintf(fid,'*x/');
  fprintf(fid,'%9.8f',L);
  fprintf(fid,')\n');
  fprintf(fid,'\n');
end
fclose(fid);
```

Fourier Series of Coil #1 WaveForm

---

N = 0
A Term = 0.32151000000000080000*cos(3.1415927*0*x/10.00000000)
B Term = 0.00000000000000000000*sin(3.1415927*0*x/10.00000000)

N = 1
A Term = -0.05486015000563282400*cos(3.1415927*1*x/10.00000000)
B Term = 3.59960771976998780000*sin(3.1415927*1*x/10.00000000)

N = 2
A Term = -0.28606410623826406000*cos(3.1415927*2*x/10.00000000)
B Term = 1.31790776415870600000*sin(3.1415927*2*x/10.00000000)

N = 3
A Term = 0.02127969436458058600*cos(3.1415927*3*x/10.00000000)
B Term = 0.68364708872142377000*sin(3.1415927*3*x/10.00000000)

N = 4
A Term = -0.12370743263194371000*cos(3.1415927*4*x/10.00000000)
B Term = 0.32864714547868346000*sin(3.1415927*4*x/10.00000000)

N = 5
A Term = 0.06624931097526866300*cos(3.1415927*5*x/10.00000000)
B Term = -0.00202007584984204580*sin(3.1415927*5*x/10.00000000)

N = 6
A Term = 0.02232680536410826600*cos(3.1415927*6*x/10.00000000)
B Term = -0.00262224676588311510*sin(3.1415927*6*x/10.00000000)

N = 7
A Term = 0.01892140443709789500*cos(3.1415927*7*x/10.00000000)
B Term = -0.15843526909556116000*sin(3.1415927*7*x/10.00000000)

N = 8
A Term = 0.07502481994225042300*cos(3.1415927*8*x/10.00000000)
B Term = -0.08235904454089781900*sin(3.1415927*8*x/10.00000000)

N = 9
A Term = -0.05130372995787575700*cos(3.1415927*9*x/10.00000000)
B Term = -0.06472085885657588600*sin(3.1415927*9*x/10.00000000)

N = 10
A Term = 0.03963932407652325000*cos(3.1415927*10*x/10.00000000)
B Term = -0.04893408424081575200*sin(3.1415927*10*x/10.00000000)

N = 11
A Term = -0.04741530329485993400*cos(3.1415927*11*x/10.00000000)
B Term = 0.05525853461247107900*sin(3.1415927*11*x/10.00000000)

N = 12
A Term = -0.01948282817234723400*cos(3.1415927*12*x/10.00000000)
B Term = 0.00185072898389278590*sin(3.1415927*12*x/10.00000000)

N = 13
A Term = 0.01923342680901290300*cos(3.1415927*13*x/10.00000000)
B Term = 0.06647372279285850000*sin(3.1415927*13*x/10.00000000)

N = 14
A Term = -0.04283176627266559900*cos(3.1415927*14*x/10.00000000)
B Term = 0.02297951841575042500*sin(3.1415927*14*x/10.00000000)

```
N =   15
A Term =   0.0531846241354064360 0*cos(3.1415927*15*x/10.00000000)
B Term =  -0.0055550811738919138 0*sin(3.1415927*15*x/10.00000000)

N =   16
A Term =  -0.0196629513688358800 0*cos(3.1415927*16*x/10.00000000)
B Term =   0.0162258629225493670 0*sin(3.1415927*16*x/10.00000000)

N =   17
A Term =   0.0132599264609646780 0*cos(3.1415927*17*x/10.00000000)
B Term =  -0.0503450186765411480 0*sin(3.1415927*17*x/10.00000000)

N =   18
A Term =   0.0173991922239760850 0*cos(3.1415927*18*x/10.00000000)
B Term =   0.0023125631743215274 0*sin(3.1415927*18*x/10.00000000)

N =   19
A Term =  -0.0378431079678390940 0*cos(3.1415927*19*x/10.00000000)
B Term =  -0.0202643859292199190 0*sin(3.1415927*19*x/10.00000000)

N =   20
A Term =   0.0305454166594865130 0*cos(3.1415927*20*x/10.00000000)
B Term =  -0.0068581871770777006 0*sin(3.1415927*20*x/10.00000000)

N =   21
A Term =  -0.0317535123931450140 0*cos(3.1415927*21*x/10.00000000)
B Term =   0.0276007300158602440 0*sin(3.1415927*21*x/10.00000000)

N =   22
A Term =   0.0109749426009833620 0*cos(3.1415927*22*x/10.00000000)
B Term =  -0.0099898340439625935 0*sin(3.1415927*22*x/10.00000000)

N =   23
A Term =   0.0132609412457963210 0*cos(3.1415927*23*x/10.00000000)
B Term =   0.0276488000738274070 0*sin(3.1415927*23*x/10.00000000)

N =   24
A Term =  -0.0173647193343412460 0*cos(3.1415927*24*x/10.00000000)
B Term =  -0.0063998862072306489 0*sin(3.1415927*24*x/10.00000000)

N =   25
A Term =   0.0316320801153572510 0*cos(3.1415927*25*x/10.00000000)
B Term =  -0.0077566376300585967 0*sin(3.1415927*25*x/10.00000000)

N =   26
A Term =  -0.0243266200697298400 0*cos(3.1415927*26*x/10.00000000)
B Term =   0.0032761310661935036 0*sin(3.1415927*26*x/10.00000000)

N =   27
A Term =   0.0064778072733550161 0*cos(3.1415927*27*x/10.00000000)
B Term =  -0.0227359448271021270 0*sin(3.1415927*27*x/10.00000000)

N =   28
A Term =  -0.0044856746879287143 0*cos(3.1415927*28*x/10.00000000)
B Term =   0.0108193586954495050 0*sin(3.1415927*28*x/10.00000000)

N =   29
A Term =  -0.0190198654312205530 0*cos(3.1415927*29*x/10.00000000)
B Term =  -0.0032149358994449997 0*sin(3.1415927*29*x/10.00000000)

N =   30
A Term =   0.0184780729949218720 0*cos(3.1415927*30*x/10.00000000)
B Term =   0.0068046441561874609 0*sin(3.1415927*30*x/10.00000000)
```

```
N =   31
A Term =  -0.0133554296567499570*cos(3.1415927*31*x/10.00000000)
B Term =   0.0139717541741661910*sin(3.1415927*31*x/10.00000000)

N =   32
A Term =   0.0189522537309844840*cos(3.1415927*32*x/10.00000000)
B Term =  -0.0054002528060975406*sin(3.1415927*32*x/10.00000000)

N =   33
A Term =   0.0052523930126161297*cos(3.1415927*33*x/10.00000000)
B Term =   0.0053972619104937251*sin(3.1415927*33*x/10.00000000)

N =   34
A Term =  -0.0018150016867969989*cos(3.1415927*34*x/10.00000000)
B Term =  -0.0111104382235031170*sin(3.1415927*34*x/10.00000000)

N =   35
A Term =   0.0088402498815769292*cos(3.1415927*35*x/10.00000000)
B Term =  -0.0082664620577748479*sin(3.1415927*35*x/10.00000000)

N =   36
A Term =  -0.0185378190040942810*cos(3.1415927*36*x/10.00000000)
B Term =  -0.0032637377760416845*sin(3.1415927*36*x/10.00000000)

N =   37
A Term =   0.0009085833209391148*cos(3.1415927*37*x/10.00000000)
B Term =  -0.0036900601801236606*sin(3.1415927*37*x/10.00000000)

N =   38
A Term =  -0.0126058275654862670*cos(3.1415927*38*x/10.00000000)
B Term =   0.0076656553698816257*sin(3.1415927*38*x/10.00000000)

N =   39
A Term =  -0.0009546823565608798*cos(3.1415927*39*x/10.00000000)
B Term =   0.0075918385705496805*sin(3.1415927*39*x/10.00000000)

N =   40
A Term =   0.0068289777103708402*cos(3.1415927*40*x/10.00000000)
B Term =   0.0080259159668327092*sin(3.1415927*40*x/10.00000000)

N =   41
A Term =   0.0018667289266512872*cos(3.1415927*41*x/10.00000000)
B Term =   0.0036137147104371966*sin(3.1415927*41*x/10.00000000)

N =   42
A Term =   0.0161227885733327140*cos(3.1415927*42*x/10.00000000)
B Term =  -0.0008798035841349266*sin(3.1415927*42*x/10.00000000)

N =   43
A Term =  -0.0022553136645874720*cos(3.1415927*43*x/10.00000000)
B Term =  -0.0090188027572160531*sin(3.1415927*43*x/10.00000000)

N =   44
A Term =   0.0061823053084927825*cos(3.1415927*44*x/10.00000000)
B Term =  -0.0065341843148227306*sin(3.1415927*44*x/10.00000000)

N =   45
A Term =  -0.0082189155590227971*cos(3.1415927*45*x/10.00000000)
B Term =  -0.0072906752868269545*sin(3.1415927*45*x/10.00000000)

N =   46
A Term =  -0.0090075143442285097*cos(3.1415927*46*x/10.00000000)
```

B Term = -0.0033728682023402832*sin(3.1415927*46*x/10.00000000)

N = 47
A Term = -0.0019003430128970646*cos(3.1415927*47*x/10.00000000)
B Term = 0.0080387371154728385*sin(3.1415927*47*x/10.00000000)

N = 48
A Term = -0.011870335168388679*cos(3.1415927*48*x/10.00000000)
B Term = 0.0018652404001303097*sin(3.1415927*48*x/10.00000000)

N = 49
A Term = 0.011108481796120707*cos(3.1415927*49*x/10.00000000)
B Term = 0.012412469340371731*sin(3.1415927*49*x/10.00000000)

N = 50
A Term = -0.0015911742318947758*cos(3.1415927*50*x/10.00000000)
B Term = 0.0026041620819916042*sin(3.1415927*50*x/10.00000000)

N = 51
A Term = 0.0098952903950090595*cos(3.1415927*51*x/10.00000000)
B Term = -0.0025433136145555793*sin(3.1415927*51*x/10.00000000)

N = 52
A Term = 0.0083419574543364249*cos(3.1415927*52*x/10.00000000)
B Term = 0.0010006130429782900*sin(3.1415927*52*x/10.00000000)

N = 53
A Term = -0.0070984848785146512*cos(3.1415927*53*x/10.00000000)
B Term = -0.014638620042243051*sin(3.1415927*53*x/10.00000000)

N = 54
A Term = 0.0078045368995204034*cos(3.1415927*54*x/10.00000000)
B Term = 0.0009372352378829727*sin(3.1415927*54*x/10.00000000)

N = 55
A Term = -0.015527420915819452*cos(3.1415927*55*x/10.00000000)
B Term = -0.0054695495903179566*sin(3.1415927*55*x/10.00000000)

N = 56
A Term = -0.00031068263743843705*cos(3.1415927*56*x/10.00000000)
B Term = 0.00045535291016017012*sin(3.1415927*56*x/10.00000000)

N = 57
A Term = -0.0017198005312067978*cos(3.1415927*57*x/10.00000000)
B Term = 0.011349671591671150*sin(3.1415927*57*x/10.00000000)

N = 58
A Term = -0.0065011884778357386*cos(3.1415927*58*x/10.00000000)
B Term = -0.0028228498609888515*sin(3.1415927*58*x/10.00000000)

N = 59
A Term = 0.014762055470248081*cos(3.1415927*59*x/10.00000000)
B Term = 0.011523906866652799*sin(3.1415927*59*x/10.00000000)

N = 60
A Term = -0.0054692876396504478*cos(3.1415927*60*x/10.00000000)
B Term = -0.0044911580673016559*sin(3.1415927*60*x/10.00000000)

N = 61
A Term = 0.0099814346913377500*cos(3.1415927*61*x/10.00000000)
B Term = -0.0038419882522495296*sin(3.1415927*61*x/10.00000000)

N = 62

```
A Term =   0.00047679155335931677*cos(3.1415927*62*x/10.00000000)
B Term =   0.00041315228612778701*sin(3.1415927*62*x/10.00000000)

N =   63
A Term =  -0.00830793700369917950*cos(3.1415927*63*x/10.00000000)
B Term =  -0.01216080976658390900*sin(3.1415927*63*x/10.00000000)

N =   64
A Term =   0.00531478250010750540*cos(3.1415927*64*x/10.00000000)
B Term =   0.00691916775064072180*sin(3.1415927*64*x/10.00000000)

N =   65
A Term =  -0.01327873704499691600*cos(3.1415927*65*x/10.00000000)
B Term =  -0.00358982664265015830*sin(3.1415927*65*x/10.00000000)

N =   66
A Term =   0.00470244489436939810*cos(3.1415927*66*x/10.00000000)
B Term =   0.00499158341120479330*sin(3.1415927*66*x/10.00000000)

N =   67
A Term =   0.00044186078444939566*cos(3.1415927*67*x/10.00000000)
B Term =   0.00754977211548748040*sin(3.1415927*67*x/10.00000000)

N =   68
A Term =  -0.00061916606725582958*cos(3.1415927*68*x/10.00000000)
B Term =  -0.00474470156635318360*sin(3.1415927*68*x/10.00000000)

N =   69
A Term =   0.01107194058225292700*cos(3.1415927*69*x/10.00000000)
B Term =   0.00682202118963723140*sin(3.1415927*69*x/10.00000000)

N =   70
A Term =  -0.00524047959257894010*cos(3.1415927*70*x/10.00000000)
B Term =  -0.00931792666515206080*sin(3.1415927*70*x/10.00000000)

N =   71
A Term =   0.00452833197511323060*cos(3.1415927*71*x/10.00000000)
B Term =  -0.00129668626795288990*sin(3.1415927*71*x/10.00000000)

N =   72
A Term =  -0.00414237595537471530*cos(3.1415927*72*x/10.00000000)
B Term =  -0.00136299709646369310*sin(3.1415927*72*x/10.00000000)

N =   73
A Term =  -0.00638004680540780500*cos(3.1415927*73*x/10.00000000)
B Term =  -0.00483632724329400870*sin(3.1415927*73*x/10.00000000)

N =   74
A Term =   0.00155576684012201500*cos(3.1415927*74*x/10.00000000)
B Term =   0.00903414933907483940*sin(3.1415927*74*x/10.00000000)

N =   75
A Term =  -0.00525803316638073350*cos(3.1415927*75*x/10.00000000)
B Term =  -0.00227114132641837710*sin(3.1415927*75*x/10.00000000)

N =   76
A Term =   0.00530363606356375540*cos(3.1415927*76*x/10.00000000)
B Term =   0.00760031213570345680*sin(3.1415927*76*x/10.00000000)

N =   77
A Term =   0.00294788000475155200*cos(3.1415927*77*x/10.00000000)
B Term =   0.00025259568186932000*sin(3.1415927*77*x/10.00000000)
```

```
N =   78
A Term =   0.0028076423157414230 0*cos(3.1415927*78*x/10.00000000)
B Term =  -0.0039045218609586271 0*sin(3.1415927*78*x/10.00000000)

N =   79
A Term =   0.0036994652767218870 0*cos(3.1415927*79*x/10.00000000)
B Term =   0.0012046148849771073 0*sin(3.1415927*79*x/10.00000000)

N =   80
A Term =  -0.0026293246468588037 0*cos(3.1415927*80*x/10.00000000)
B Term =  -0.0099579336357558616 0*sin(3.1415927*80*x/10.00000000)

N =   81
A Term =  -0.0023522570484329325 0*cos(3.1415927*81*x/10.00000000)
B Term =   0.0028012187982407095 0*sin(3.1415927*81*x/10.00000000)

N =   82
A Term =  -0.0044358283662130731 0*cos(3.1415927*82*x/10.00000000)
B Term =  -0.0028895982172824535 0*sin(3.1415927*82*x/10.00000000)

N =   83
A Term =  -0.0029088739042537055 0*cos(3.1415927*83*x/10.00000000)
B Term =   0.0028788647830892636 0*sin(3.1415927*83*x/10.00000000)

N =   84
A Term =  -0.0010973983545608744 0*cos(3.1415927*84*x/10.00000000)
B Term =   0.0071706304796188766 0*sin(3.1415927*84*x/10.00000000)

N =   85
A Term =   0.0032382035372657799 0*cos(3.1415927*85*x/10.00000000)
B Term =  -0.0017602064034450719 0*sin(3.1415927*85*x/10.00000000)

N =   86
A Term =   0.0026820354184062820 0*cos(3.1415927*86*x/10.00000000)
B Term =   0.0071865316985725196 0*sin(3.1415927*86*x/10.00000000)

N =   87
A Term =   0.0043488768376056496 0*cos(3.1415927*87*x/10.00000000)
B Term =  -0.0062609303051932566 0*sin(3.1415927*87*x/10.00000000)

N =   88
A Term =   0.0027622737957264418 0*cos(3.1415927*88*x/10.00000000)
B Term =  -0.0014693596297041794 0*sin(3.1415927*88*x/10.00000000)

N =   89
A Term =  -0.0029882046029145407 0*cos(3.1415927*89*x/10.00000000)
B Term =  -0.0026670770798251555 0*sin(3.1415927*89*x/10.00000000)

N =   90
A Term =   0.0002542389962024417 2*cos(3.1415927*90*x/10.00000000)
B Term =  -0.0068424389283567762 0*sin(3.1415927*90*x/10.00000000)

N =   91
A Term =  -0.0068531968595609482 0*cos(3.1415927*91*x/10.00000000)
B Term =   0.0059825349591229177 0*sin(3.1415927*91*x/10.00000000)

N =   92
A Term =  -0.0014873033274640235 0*cos(3.1415927*92*x/10.00000000)
B Term =  -0.0032651949711232707 0*sin(3.1415927*92*x/10.00000000)

N =   93
A Term =   0.0002146301572817036 6*cos(3.1415927*93*x/10.00000000)
B Term =   0.0072885390481473387 0*sin(3.1415927*93*x/10.00000000)
```

```
N =   94
A Term =  -0.0015332881674725045 0*cos(3.1415927*94*x/10.00000000)
B Term =   0.0030274400521080563 0*sin(3.1415927*94*x/10.00000000)

N =   95
A Term =   0.0078905452188810996 0*cos(3.1415927*95*x/10.00000000)
B Term =  -0.0019082805713028360 0*sin(3.1415927*95*x/10.00000000)

N =   96
A Term =  -0.0009315162960449003 6*cos(3.1415927*96*x/10.00000000)
B Term =   0.0043737405217260652 0*sin(3.1415927*96*x/10.00000000)

N =   97
A Term =   0.0040121350075898342 0*cos(3.1415927*97*x/10.00000000)
B Term =  -0.0089352124251846354 0*sin(3.1415927*97*x/10.00000000)

N =   98
A Term =   0.0001445892001708530 5*cos(3.1415927*98*x/10.00000000)
B Term =   0.0009881289381503918 0*sin(3.1415927*98*x/10.00000000)

N =   99
A Term =  -0.0058893944303251410 0*cos(3.1415927*99*x/10.00000000)
B Term =  -0.0034371983360232082 0*sin(3.1415927*99*x/10.00000000)

N =  100
A Term =   0.0018319495270456385 0*cos(3.1415927*100*x/10.00000000)
B Term =  -0.0021090708375079556 0*sin(3.1415927*100*x/10.00000000)
```

Fourier Series of Coil #2 WaveForm

N = 0
A Term = -2.74361999999999990000*cos(3.1415927*0*x/10.00000000)
B Term = 0.00000000000000000000*sin(3.1415927*0*x/10.00000000)

N = 1
A Term = -1.15811931552203710000*cos(3.1415927*1*x/10.00000000)
B Term = -4.13845525093240150000*sin(3.1415927*1*x/10.00000000)

N = 2
A Term = 1.32342418551513720000*cos(3.1415927*2*x/10.00000000)
B Term = -1.25340345275166750000*sin(3.1415927*2*x/10.00000000)

N = 3
A Term = 0.43062339326826637000*cos(3.1415927*3*x/10.00000000)
B Term = -0.66035027064241847000*sin(3.1415927*3*x/10.00000000)

N = 4
A Term = 0.84711439711922676000*cos(3.1415927*4*x/10.00000000)
B Term = -0.28985906421062146000*sin(3.1415927*4*x/10.00000000)

N = 5
A Term = 0.30784754656924740000*cos(3.1415927*5*x/10.00000000)
B Term = 0.12045508076403209000*sin(3.1415927*5*x/10.00000000)

N = 6
A Term = 0.31598393736477626000*cos(3.1415927*6*x/10.00000000)
B Term = -0.03663733665335258700*sin(3.1415927*6*x/10.00000000)

N = 7
A Term = 0.16908025881034028000*cos(3.1415927*7*x/10.00000000)
B Term = 0.22205448731130051000*sin(3.1415927*7*x/10.00000000)

N = 8
A Term = -0.02500733130668391900*cos(3.1415927*8*x/10.00000000)
B Term = 0.02227928441091642200*sin(3.1415927*8*x/10.00000000)

N = 9
A Term = 0.09859030544601543600*cos(3.1415927*9*x/10.00000000)
B Term = 0.04376589727745757600*sin(3.1415927*9*x/10.00000000)

N = 10
A Term = -0.07858550079168165300*cos(3.1415927*10*x/10.00000000)
B Term = 0.05042126348264409900*sin(3.1415927*10*x/10.00000000)

N = 11
A Term = 0.03923496228642797000*cos(3.1415927*11*x/10.00000000)
B Term = -0.10986526678221016000*sin(3.1415927*11*x/10.00000000)

N = 12
A Term = 0.04169530091430402600*cos(3.1415927*12*x/10.00000000)
B Term = 0.05410387764194173700*sin(3.1415927*12*x/10.00000000)

N = 13
A Term = -0.02184716823760496400*cos(3.1415927*13*x/10.00000000)
B Term = -0.09358682604005536000*sin(3.1415927*13*x/10.00000000)

N = 14
A Term = 0.12973417978276905000*cos(3.1415927*14*x/10.00000000)
B Term = 0.00780322487170587770*sin(3.1415927*14*x/10.00000000)

```
N =   15
A Term =  -0.03512903837810938500*cos(3.1415927*15*x/10.00000000)
B Term =   0.02377366768572087100*sin(3.1415927*15*x/10.00000000)

N =   16
A Term =   0.08461697643085192000*cos(3.1415927*16*x/10.00000000)
B Term =  -0.04802885001383761000*sin(3.1415927*16*x/10.00000000)

N =   17
A Term =   0.01346508119979164900*cos(3.1415927*17*x/10.00000000)
B Term =   0.08577663069815681700*sin(3.1415927*17*x/10.00000000)

N =   18
A Term =  -0.01924792143832004800*cos(3.1415927*18*x/10.00000000)
B Term =  -0.04664597881991877600*sin(3.1415927*18*x/10.00000000)

N =   19
A Term =   0.06062152266883882900*cos(3.1415927*19*x/10.00000000)
B Term =   0.03498715537731213900*sin(3.1415927*19*x/10.00000000)

N =   20
A Term =  -0.05564215108891779100*cos(3.1415927*20*x/10.00000000)
B Term =   0.00903635704816874680*sin(3.1415927*20*x/10.00000000)

N =   21
A Term =   0.04559523293367111900*cos(3.1415927*21*x/10.00000000)
B Term =  -0.04473185345555226500*sin(3.1415927*21*x/10.00000000)

N =   22
A Term =  -0.00207830510075500020*cos(3.1415927*22*x/10.00000000)
B Term =   0.04735349259883375000*sin(3.1415927*22*x/10.00000000)

N =   23
A Term =  -0.00958332265630864630*cos(3.1415927*23*x/10.00000000)
B Term =  -0.05474109917508092300*sin(3.1415927*23*x/10.00000000)

N =   24
A Term =   0.05571730548432476900*cos(3.1415927*24*x/10.00000000)
B Term =   0.02465410998371071700*sin(3.1415927*24*x/10.00000000)

N =   25
A Term =  -0.03524028832314136900*cos(3.1415927*25*x/10.00000000)
B Term =   0.00007207656450507609*sin(3.1415927*25*x/10.00000000)

N =   26
A Term =   0.04789741788620281700*cos(3.1415927*26*x/10.00000000)
B Term =  -0.02211360821528025900*sin(3.1415927*26*x/10.00000000)

N =   27
A Term =  -0.00808618491691309900*cos(3.1415927*27*x/10.00000000)
B Term =   0.04064425795521726300*sin(3.1415927*27*x/10.00000000)

N =   28
A Term =  -0.00129488993250056680*cos(3.1415927*28*x/10.00000000)
B Term =  -0.03361868854387191400*sin(3.1415927*28*x/10.00000000)

N =   29
A Term =   0.02783762211641897100*cos(3.1415927*29*x/10.00000000)
B Term =   0.02493656147269140300*sin(3.1415927*29*x/10.00000000)

N =   30
A Term =  -0.02621844534886263000*cos(3.1415927*30*x/10.00000000)
B Term =  -0.00515772548244608500*sin(3.1415927*30*x/10.00000000)
```

```
N =   31
A Term =   0.028913371567639720000*cos(3.1415927*31*x/10.00000000)
B Term =  -0.012686788482275042000*sin(3.1415927*31*x/10.00000000)

N =   32
A Term =  -0.008309204434931208000*cos(3.1415927*32*x/10.00000000)
B Term =   0.020435946628001661000*sin(3.1415927*32*x/10.00000000)

N =   33
A Term =   0.003859961747310230500*cos(3.1415927*33*x/10.00000000)
B Term =  -0.024167618088457948000*sin(3.1415927*33*x/10.00000000)

N =   34
A Term =   0.017200292050735217000*cos(3.1415927*34*x/10.00000000)
B Term =   0.016659585647986832000*sin(3.1415927*34*x/10.00000000)

N =   35
A Term =  -0.012337750331000430000*cos(3.1415927*35*x/10.00000000)
B Term =  -0.007627816012536429300*sin(3.1415927*35*x/10.00000000)

N =   36
A Term =   0.020753540332236697000*cos(3.1415927*36*x/10.00000000)
B Term =  -0.001348981585070336300*sin(3.1415927*36*x/10.00000000)

N =   37
A Term =  -0.007904841787930274100*cos(3.1415927*37*x/10.00000000)
B Term =   0.008289332544644867400*sin(3.1415927*37*x/10.00000000)

N =   38
A Term =   0.009238486891919590900*cos(3.1415927*38*x/10.00000000)
B Term =  -0.010259090790184005000*sin(3.1415927*38*x/10.00000000)

N =   39
A Term =   0.002640530963144678900*cos(3.1415927*39*x/10.00000000)
B Term =   0.010058071522019096000*sin(3.1415927*39*x/10.00000000)

N =   40
A Term =   0.000280118864226420020*cos(3.1415927*40*x/10.00000000)
B Term =  -0.007994458457872786000*sin(3.1415927*40*x/10.00000000)

N =   41
A Term =   0.008148008147307385000*cos(3.1415927*41*x/10.00000000)
B Term =   0.005667533575856137700*sin(3.1415927*41*x/10.00000000)

N =   42
A Term =  -0.003513699938730728900*cos(3.1415927*42*x/10.00000000)
B Term =  -0.003058284841748791000*sin(3.1415927*42*x/10.00000000)

N =   43
A Term =   0.010114936194049443000*cos(3.1415927*43*x/10.00000000)
B Term =   0.000697233011503338440*sin(3.1415927*43*x/10.00000000)

N =   44
A Term =  -0.005189213974838621100*cos(3.1415927*44*x/10.00000000)
B Term =   0.003105641676626676300*sin(3.1415927*44*x/10.00000000)

N =   45
A Term =   0.008327409965116034900*cos(3.1415927*45*x/10.00000000)
B Term =  -0.006821238922334907500*sin(3.1415927*45*x/10.00000000)

N =   46
A Term =  -0.000327688090596569600*cos(3.1415927*46*x/10.00000000)
```

```
B Term =   0.0098872772211274430*sin(3.1415927*46*x/10.00000000)

N =   47
A Term =  -0.0009758279447214936 0*cos(3.1415927*47*x/10.00000000)
B Term =  -0.0115996605347519630 0*sin(3.1415927*47*x/10.00000000)

N =   48
A Term =   0.0115898361673857570 0*cos(3.1415927*48*x/10.00000000)
B Term =   0.0085782653405022339 0*sin(3.1415927*48*x/10.00000000)

N =   49
A Term =  -0.0111037311813891800 0*cos(3.1415927*49*x/10.00000000)
B Term =  -0.0034600167682348987 0*sin(3.1415927*49*x/10.00000000)

N =   50
A Term =   0.0165556943606118900 0*cos(3.1415927*50*x/10.00000000)
B Term =  -0.0046425273623680830 0*sin(3.1415927*50*x/10.00000000)

N =   51
A Term =  -0.0075116840441999070 0*cos(3.1415927*51*x/10.00000000)
B Term =   0.0122277707512014940 0*sin(3.1415927*51*x/10.00000000)

N =   52
A Term =   0.0037820579951127892 0*cos(3.1415927*52*x/10.00000000)
B Term =  -0.0154758819319215540 0*sin(3.1415927*52*x/10.00000000)

N =   53
A Term =   0.0092677542576301321 0*cos(3.1415927*53*x/10.00000000)
B Term =   0.0149648225228825820 0*sin(3.1415927*53*x/10.00000000)

N =   54
A Term =  -0.0134000181653234140 0*cos(3.1415927*54*x/10.00000000)
B Term =  -0.0076377535127310050 0*sin(3.1415927*54*x/10.00000000)

N =   55
A Term =   0.0183022197318859870 0*cos(3.1415927*55*x/10.00000000)
B Term =  -0.0019656284252109169 0*sin(3.1415927*55*x/10.00000000)

N =   56
A Term =  -0.0118971860016243830 0*cos(3.1415927*56*x/10.00000000)
B Term =   0.0113193725874746900 0*sin(3.1415927*56*x/10.00000000)

N =   57
A Term =   0.0058683087042098033 0*cos(3.1415927*57*x/10.00000000)
B Term =  -0.0177376165601248400 0*sin(3.1415927*57*x/10.00000000)

N =   58
A Term =   0.0078325505035068844 0*cos(3.1415927*58*x/10.00000000)
B Term =   0.0167209708285464830 0*sin(3.1415927*58*x/10.00000000)

N =   59
A Term =  -0.0130054805927583210 0*cos(3.1415927*59*x/10.00000000)
B Term =  -0.0110234670015032150 0*sin(3.1415927*59*x/10.00000000)

N =   60
A Term =   0.0200198956032331400 0*cos(3.1415927*60*x/10.00000000)
B Term =   0.0007510258427627028 3*sin(3.1415927*60*x/10.00000000)

N =   61
A Term =  -0.0137076192260253000 0*cos(3.1415927*61*x/10.00000000)
B Term =   0.0095976698632426489 0*sin(3.1415927*61*x/10.00000000)

N =   62
```

```
A Term =   0.0087521777244055545O*cos(3.1415927*62*x/10.00000000)
B Term =  -0.0157007384566530440O*sin(3.1415927*62*x/10.00000000)

N =   63
A Term =   0.0040600756696807083O*cos(3.1415927*63*x/10.00000000)
B Term =   0.0171247432942151220O*sin(3.1415927*63*x/10.00000000)

N =   64
A Term =  -0.0104589011307590070O*cos(3.1415927*64*x/10.00000000)
B Term =  -0.0116909565702916360O*sin(3.1415927*64*x/10.00000000)

N =   65
A Term =   0.0165761410430864920O*cos(3.1415927*65*x/10.00000000)
B Term =   0.0031261088096603928O*sin(3.1415927*65*x/10.00000000)

N =   66
A Term =  -0.0131405435346084070O*cos(3.1415927*66*x/10.00000000)
B Term =   0.0059260529352442269O*sin(3.1415927*66*x/10.00000000)

N =   67
A Term =   0.0090315064216503291O*cos(3.1415927*67*x/10.00000000)
B Term =  -0.0127273033234042410O*sin(3.1415927*67*x/10.00000000)

N =   68
A Term =   0.0015472398005994543O*cos(3.1415927*68*x/10.00000000)
B Term =   0.0140803340070341210O*sin(3.1415927*68*x/10.00000000)

N =   69
A Term =  -0.0066019213303499108O*cos(3.1415927*69*x/10.00000000)
B Term =  -0.0113073345008672230O*sin(3.1415927*69*x/10.00000000)

N =   70
A Term =   0.0132349476724320910O*cos(3.1415927*70*x/10.00000000)
B Term =   0.0048802541100345662O*sin(3.1415927*70*x/10.00000000)

N =   71
A Term =  -0.0108611780287147590O*cos(3.1415927*71*x/10.00000000)
B Term =   0.0022965340316249603O*sin(3.1415927*71*x/10.00000000)

N =   72
A Term =   0.0093732893565738520O*cos(3.1415927*72*x/10.00000000)
B Term =  -0.0075744612236457454O*sin(3.1415927*72*x/10.00000000)

N =   73
A Term =  -0.0018326404848082994O*cos(3.1415927*73*x/10.00000000)
B Term =   0.0101754245961586750O*sin(3.1415927*73*x/10.00000000)

N =   74
A Term =  -0.0018219399684994892O*cos(3.1415927*74*x/10.00000000)
B Term =  -0.0091179224318156948O*sin(3.1415927*74*x/10.00000000)

N =   75
A Term =   0.0073007355851001966O*cos(3.1415927*75*x/10.00000000)
B Term =   0.0058517422915903639O*sin(3.1415927*75*x/10.00000000)

N =   76
A Term =  -0.0069504576345350670O*cos(3.1415927*76*x/10.00000000)
B Term =  -0.0015851337231457187O*sin(3.1415927*76*x/10.00000000)

N =   77
A Term =   0.0077721624523386049O*cos(3.1415927*77*x/10.00000000)
B Term =  -0.0024073754721270668O*sin(3.1415927*77*x/10.00000000)
```

```
N =   78
A Term =  -0.0036798069309671808 0*cos(3.1415927*78*x/10.00000000)
B Term =   0.0050255159793955763 0*sin(3.1415927*78*x/10.00000000)

N =   79
A Term =   0.0023903139383292930 0*cos(3.1415927*79*x/10.00000000)
B Term =  -0.0062182115077877159 0*sin(3.1415927*79*x/10.00000000)

N =   80
A Term =   0.0021598036863759197 0*cos(3.1415927*80*x/10.00000000)
B Term =   0.0060000260414740441 0*sin(3.1415927*80*x/10.00000000)

N =   81
A Term =  -0.0029793319150743336 0*cos(3.1415927*81*x/10.00000000)
B Term =  -0.0047267778468731694 0*sin(3.1415927*81*x/10.00000000)

N =   82
A Term =   0.0061997905152497918 0*cos(3.1415927*82*x/10.00000000)
B Term =   0.0026255827647686881 0*sin(3.1415927*82*x/10.00000000)

N =   83
A Term =  -0.0054077338675125467 0*cos(3.1415927*83*x/10.00000000)
B Term =  -0.0000472036644342260 4*sin(3.1415927*83*x/10.00000000)

N =   84
A Term =   0.0064791145300070203 0*cos(3.1415927*84*x/10.00000000)
B Term =  -0.0028664298311290746 0*sin(3.1415927*84*x/10.00000000)

N =   85
A Term =  -0.0031209583622184337 0*cos(3.1415927*85*x/10.00000000)
B Term =   0.0053964049823805290 0*sin(3.1415927*85*x/10.00000000)

N =   86
A Term =   0.0015611029782000650 0*cos(3.1415927*86*x/10.00000000)
B Term =  -0.0068829261429385769 0*sin(3.1415927*86*x/10.00000000)

N =   87
A Term =   0.0036258233382209675 0*cos(3.1415927*87*x/10.00000000)
B Term =   0.0067576109780410620 0*sin(3.1415927*87*x/10.00000000)

N =   88
A Term =  -0.0056336869450581105 0*cos(3.1415927*88*x/10.00000000)
B Term =  -0.0043581734731201983 0*sin(3.1415927*88*x/10.00000000)

N =   89
A Term =   0.0086772744890527484 0*cos(3.1415927*89*x/10.00000000)
B Term =   0.0004705398362527175 0*sin(3.1415927*89*x/10.00000000)

N =   90
A Term =  -0.0068431030914881093 0*cos(3.1415927*90*x/10.00000000)
B Term =   0.0042031246184459836 0*sin(3.1415927*90*x/10.00000000)

N =   91
A Term =   0.0047102759109735491 0*cos(3.1415927*91*x/10.00000000)
B Term =  -0.0079849858328347907 0*sin(3.1415927*91*x/10.00000000)

N =   92
A Term =   0.0014768629489374434 0*cos(3.1415927*92*x/10.00000000)
B Term =   0.0092553790003768125 0*sin(3.1415927*92*x/10.00000000)

N =   93
A Term =  -0.0054360543533325725 0*cos(3.1415927*93*x/10.00000000)
B Term =  -0.0077057750467165835 0*sin(3.1415927*93*x/10.00000000)
```

```
A Term =   0.00875217772440555450*cos(3.1415927*62*x/10.00000000)
B Term =  -0.01570073845665304400*sin(3.1415927*62*x/10.00000000)

N =   63
A Term =   0.00406007566968070830*cos(3.1415927*63*x/10.00000000)
B Term =   0.01712474329421512200*sin(3.1415927*63*x/10.00000000)

N =   64
A Term =  -0.01045890113075900700*cos(3.1415927*64*x/10.00000000)
B Term =  -0.01169095657029163600*sin(3.1415927*64*x/10.00000000)

N =   65
A Term =   0.01657614104308649200*cos(3.1415927*65*x/10.00000000)
B Term =   0.00312610880966039280*sin(3.1415927*65*x/10.00000000)

N =   66
A Term =  -0.01314054353460840700*cos(3.1415927*66*x/10.00000000)
B Term =   0.00592605293524422690*sin(3.1415927*66*x/10.00000000)

N =   67
A Term =   0.00903150642165032910*cos(3.1415927*67*x/10.00000000)
B Term =  -0.01272730332340424100*sin(3.1415927*67*x/10.00000000)

N =   68
A Term =   0.00154723980059945430*cos(3.1415927*68*x/10.00000000)
B Term =   0.01408033400703412100*sin(3.1415927*68*x/10.00000000)

N =   69
A Term =  -0.00660192133034991080*cos(3.1415927*69*x/10.00000000)
B Term =  -0.01130733450086722300*sin(3.1415927*69*x/10.00000000)

N =   70
A Term =   0.01323494767243209100*cos(3.1415927*70*x/10.00000000)
B Term =   0.00488025411003456620*sin(3.1415927*70*x/10.00000000)

N =   71
A Term =  -0.01086117802871475900*cos(3.1415927*71*x/10.00000000)
B Term =   0.00229653403162496030*sin(3.1415927*71*x/10.00000000)

N =   72
A Term =   0.00937328935657385200*cos(3.1415927*72*x/10.00000000)
B Term =  -0.00757446122364574540*sin(3.1415927*72*x/10.00000000)

N =   73
A Term =  -0.00183264048480829940*cos(3.1415927*73*x/10.00000000)
B Term =   0.01017542459615867500*sin(3.1415927*73*x/10.00000000)

N =   74
A Term =  -0.00182193996849948920*cos(3.1415927*74*x/10.00000000)
B Term =  -0.00911792243181569480*sin(3.1415927*74*x/10.00000000)

N =   75
A Term =   0.00730073558510019660*cos(3.1415927*75*x/10.00000000)
B Term =   0.00585174229159036390*sin(3.1415927*75*x/10.00000000)

N =   76
A Term =  -0.00695045763453506700*cos(3.1415927*76*x/10.00000000)
B Term =  -0.00158513372314571870*sin(3.1415927*76*x/10.00000000)

N =   77
A Term =   0.00777216245233860490*cos(3.1415927*77*x/10.00000000)
B Term =  -0.00240737547212706680*sin(3.1415927*77*x/10.00000000)
```

```
N =   78
A Term =  -0.00367980693096718080*cos(3.1415927*78*x/10.00000000)
B Term =   0.00502551597939557630*sin(3.1415927*78*x/10.00000000)

N =   79
A Term =   0.00239031393832929300*cos(3.1415927*79*x/10.00000000)
B Term =  -0.00621821150778771590*sin(3.1415927*79*x/10.00000000)

N =   80
A Term =   0.00215980368637591970*cos(3.1415927*80*x/10.00000000)
B Term =   0.00600002604147404410*sin(3.1415927*80*x/10.00000000)

N =   81
A Term =  -0.00297933191507433360*cos(3.1415927*81*x/10.00000000)
B Term =  -0.00472677784687316940*sin(3.1415927*81*x/10.00000000)

N =   82
A Term =   0.00619979051524979180*cos(3.1415927*82*x/10.00000000)
B Term =   0.00262558276476868810*sin(3.1415927*82*x/10.00000000)

N =   83
A Term =  -0.00540773386751254670*cos(3.1415927*83*x/10.00000000)
B Term =  -0.00004720366443422604*sin(3.1415927*83*x/10.00000000)

N =   84
A Term =   0.00647911453000702030*cos(3.1415927*84*x/10.00000000)
B Term =  -0.00286642983112907460*sin(3.1415927*84*x/10.00000000)

N =   85
A Term =  -0.00312095836221843370*cos(3.1415927*85*x/10.00000000)
B Term =   0.00539640498238052900*sin(3.1415927*85*x/10.00000000)

N =   86
A Term =   0.00156110297820006500*cos(3.1415927*86*x/10.00000000)
B Term =  -0.00688292614293857690*sin(3.1415927*86*x/10.00000000)

N =   87
A Term =   0.00362582333822096750*cos(3.1415927*87*x/10.00000000)
B Term =   0.00675761097804106200*sin(3.1415927*87*x/10.00000000)

N =   88
A Term =  -0.00563368694505811050*cos(3.1415927*88*x/10.00000000)
B Term =  -0.00435817347312019830*sin(3.1415927*88*x/10.00000000)

N =   89
A Term =   0.00867727448905274840*cos(3.1415927*89*x/10.00000000)
B Term =   0.00047053983625271748*sin(3.1415927*89*x/10.00000000)

N =   90
A Term =  -0.00684310309148810930*cos(3.1415927*90*x/10.00000000)
B Term =   0.00420312461844598360*sin(3.1415927*90*x/10.00000000)

N =   91
A Term =   0.00471027591097354910*cos(3.1415927*91*x/10.00000000)
B Term =  -0.00798498583283479070*sin(3.1415927*91*x/10.00000000)

N =   92
A Term =   0.00147686294893744340*cos(3.1415927*92*x/10.00000000)
B Term =   0.00925537900037681250*sin(3.1415927*92*x/10.00000000)

N =   93
A Term =  -0.00543605435333257250*cos(3.1415927*93*x/10.00000000)
B Term =  -0.00770577504671658350*sin(3.1415927*93*x/10.00000000)
```

```
N =   94
A Term =   0.010188702081561609 00*cos(3.1415927*94*x/10.00000000)
B Term =   0.003115401456932480 00*sin(3.1415927*94*x/10.00000000)

N =   95
A Term =  -0.009245081412643903 90*cos(3.1415927*95*x/10.00000000)
B Term =   0.002643735339825341 00*sin(3.1415927*95*x/10.00000000)

N =   96
A Term =   0.007510818391512586 10*cos(3.1415927*96*x/10.00000000)
B Term =  -0.007720184402639611 50*sin(3.1415927*96*x/10.00000000)

N =   97
A Term =  -0.000810433517476481 96*cos(3.1415927*97*x/10.00000000)
B Term =   0.010404960007032534 00*sin(3.1415927*97*x/10.00000000)

N =   98
A Term =  -0.004119224646957342 20*cos(3.1415927*98*x/10.00000000)
B Term =  -0.009238236442556663 60*sin(3.1415927*98*x/10.00000000)

N =   99
A Term =   0.009516018028059599 10*cos(3.1415927*99*x/10.00000000)
B Term =   0.005089043499555301 30*sin(3.1415927*99*x/10.00000000)

N =  100
A Term =  -0.009793791247935746 20*cos(3.1415927*100*x/10.00000000)
B Term =   0.000968612406961198 78*sin(3.1415927*100*x/10.00000000)
```

Fourier Series of Coil #3 WaveForm

N = 0
A Term = -7.287799999999999360000*cos(3.1415927*0*x/10.00000000)
B Term = 0.000000000000000000000*sin(3.1415927*0*x/10.00000000)

N = 1
A Term = 4.407156042991131200000*cos(3.1415927*1*x/10.00000000)
B Term = 9.488101066874651900000*sin(3.1415927*1*x/10.00000000)

N = 2
A Term = 0.400647983255026600000*cos(3.1415927*2*x/10.00000000)
B Term = -3.287615178480584300000*sin(3.1415927*2*x/10.00000000)

N = 3
A Term = 0.774503525758356570000*cos(3.1415927*3*x/10.00000000)
B Term = 3.005975797321734700000*sin(3.1415927*3*x/10.00000000)

N = 4
A Term = 0.324849762663518780000*cos(3.1415927*4*x/10.00000000)
B Term = -1.805614453939200300000*sin(3.1415927*4*x/10.00000000)

N = 5
A Term = 0.397832122244869470000*cos(3.1415927*5*x/10.00000000)
B Term = 1.649625993239581600000*sin(3.1415927*5*x/10.00000000)

N = 6
A Term = 0.205318770782560250000*cos(3.1415927*6*x/10.00000000)
B Term = -1.347075023886597800000*sin(3.1415927*6*x/10.00000000)

N = 7
A Term = 0.181867168258234350000*cos(3.1415927*7*x/10.00000000)
B Term = 1.089229730939766000000*sin(3.1415927*7*x/10.00000000)

N = 8
A Term = 0.087521151025273455000*cos(3.1415927*8*x/10.00000000)
B Term = -1.065728348151673300000*sin(3.1415927*8*x/10.00000000)

N = 9
A Term = 0.035552035864008923000*cos(3.1415927*9*x/10.00000000)
B Term = 0.841120585924276300000*sin(3.1415927*9*x/10.00000000)

N = 10
A Term = 0.025346570417434822000*cos(3.1415927*10*x/10.00000000)
B Term = -0.819236351238513240000*sin(3.1415927*10*x/10.00000000)

N = 11
A Term = -0.010912890547950279000*cos(3.1415927*11*x/10.00000000)
B Term = 0.723469458397187570000*sin(3.1415927*11*x/10.00000000)

N = 12
A Term = 0.026364819022029036000*cos(3.1415927*12*x/10.00000000)
B Term = -0.633928739325753110000*sin(3.1415927*12*x/10.00000000)

N = 13
A Term = 0.013303199723892776000*cos(3.1415927*13*x/10.00000000)
B Term = 0.631474329198456030000*sin(3.1415927*13*x/10.00000000)

N = 14
A Term = 0.047035320356500994000*cos(3.1415927*14*x/10.00000000)
B Term = -0.541162813766945640000*sin(3.1415927*14*x/10.00000000)

Fourier Series of Coil #3 WaveForm

N = 0
A Term = -7.287799999999360000*cos(3.1415927*0*x/10.00000000)
B Term = 0.000000000000000000*sin(3.1415927*0*x/10.00000000)

N = 1
A Term = 4.407156042991131200000*cos(3.1415927*1*x/10.00000000)
B Term = 9.488101066874651900000*sin(3.1415927*1*x/10.00000000)

N = 2
A Term = 0.400647983255026600000*cos(3.1415927*2*x/10.00000000)
B Term = -3.287615178480584300000*sin(3.1415927*2*x/10.00000000)

N = 3
A Term = 0.774503525758356570000*cos(3.1415927*3*x/10.00000000)
B Term = 3.005975797321734700000*sin(3.1415927*3*x/10.00000000)

N = 4
A Term = 0.324849762663518780000*cos(3.1415927*4*x/10.00000000)
B Term = -1.805614453939200300000*sin(3.1415927*4*x/10.00000000)

N = 5
A Term = 0.397832122244869470000*cos(3.1415927*5*x/10.00000000)
B Term = 1.649625993239581600000*sin(3.1415927*5*x/10.00000000)

N = 6
A Term = 0.205318770782560250000*cos(3.1415927*6*x/10.00000000)
B Term = -1.347075023886597800000*sin(3.1415927*6*x/10.00000000)

N = 7
A Term = 0.181867168258234350000*cos(3.1415927*7*x/10.00000000)
B Term = 1.089229730939766000000*sin(3.1415927*7*x/10.00000000)

N = 8
A Term = 0.087521151025273455000*cos(3.1415927*8*x/10.00000000)
B Term = -1.065728348151673300000*sin(3.1415927*8*x/10.00000000)

N = 9
A Term = 0.035552035864008923000*cos(3.1415927*9*x/10.00000000)
B Term = 0.841120585924276300000*sin(3.1415927*9*x/10.00000000)

N = 10
A Term = 0.025346570417434822000*cos(3.1415927*10*x/10.00000000)
B Term = -0.819236351238513240000*sin(3.1415927*10*x/10.00000000)

N = 11
A Term = -0.010912890547950279000*cos(3.1415927*11*x/10.00000000)
B Term = 0.723469458397187570000*sin(3.1415927*11*x/10.00000000)

N = 12
A Term = 0.026364819022029036000*cos(3.1415927*12*x/10.00000000)
B Term = -0.633928739325753110000*sin(3.1415927*12*x/10.00000000)

N = 13
A Term = 0.013303199723892776000*cos(3.1415927*13*x/10.00000000)
B Term = 0.631474329198456030000*sin(3.1415927*13*x/10.00000000)

N = 14
A Term = 0.047035320356500994000*cos(3.1415927*14*x/10.00000000)
B Term = -0.541162813766945640000*sin(3.1415927*14*x/10.00000000)

```
N =   15
A Term =   0.03315260086104406700*cos(3.1415927*15*x/10.00000000)
B Term =   0.53645547242637026000*sin(3.1415927*15*x/10.00000000)

N =   16
A Term =   0.04764553358501690000*cos(3.1415927*16*x/10.00000000)
B Term =  -0.50472880968666611000*sin(3.1415927*16*x/10.00000000)

N =   17
A Term =   0.01253876304330971100*cos(3.1415927*17*x/10.00000000)
B Term =   0.46020092691204306000*sin(3.1415927*17*x/10.00000000)

N =   18
A Term =   0.03277522824397354600*cos(3.1415927*18*x/10.00000000)
B Term =  -0.46263615105982886000*sin(3.1415927*18*x/10.00000000)

N =   19
A Term =  -0.01848225989021693900*cos(3.1415927*19*x/10.00000000)
B Term =   0.41556045242696493000*sin(3.1415927*19*x/10.00000000)

N =   20
A Term =   0.02772433785500234800*cos(3.1415927*20*x/10.00000000)
B Term =  -0.39970362985068530000*sin(3.1415927*20*x/10.00000000)

N =   21
A Term =  -0.02245154894023093300*cos(3.1415927*21*x/10.00000000)
B Term =   0.38362520579149861000*sin(3.1415927*21*x/10.00000000)

N =   22
A Term =   0.03493578679148168900*cos(3.1415927*22*x/10.00000000)
B Term =  -0.34745272547386052000*sin(3.1415927*22*x/10.00000000)

N =   23
A Term =  -0.00693736131994262400*cos(3.1415927*23*x/10.00000000)
B Term =   0.34566490907174585000*sin(3.1415927*23*x/10.00000000)

N =   24
A Term =   0.03549393014968986500*cos(3.1415927*24*x/10.00000000)
B Term =  -0.32501707269493757000*sin(3.1415927*24*x/10.00000000)

N =   25
A Term =  -0.00286567885084546870*cos(3.1415927*25*x/10.00000000)
B Term =   0.30993451922964416000*sin(3.1415927*25*x/10.00000000)

N =   26
A Term =   0.02462208561631050100*cos(3.1415927*26*x/10.00000000)
B Term =  -0.31316689012176907000*sin(3.1415927*26*x/10.00000000)

N =   27
A Term =  -0.01559926452876011900*cos(3.1415927*27*x/10.00000000)
B Term =   0.29161036281315478000*sin(3.1415927*27*x/10.00000000)

N =   28
A Term =   0.01986687708992120000*cos(3.1415927*28*x/10.00000000)
B Term =  -0.28946182460697789000*sin(3.1415927*28*x/10.00000000)

N =   29
A Term =  -0.02406050516438000600*cos(3.1415927*29*x/10.00000000)
B Term =   0.28289878068399082000*sin(3.1415927*29*x/10.00000000)

N =   30
A Term =   0.03036884706583470000*cos(3.1415927*30*x/10.00000000)
B Term =  -0.26024659365835329000*sin(3.1415927*30*x/10.00000000)
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N =   31
A Term =  -0.0186103886148900300 0*cos(3.1415927*31*x/10.00000000)
B Term =   0.2635177895623762000 0*sin(3.1415927*31*x/10.00000000)

N =   32
A Term =   0.0397976482602010460 0*cos(3.1415927*32*x/10.00000000)
B Term =  -0.2430235552993442700 0*sin(3.1415927*32*x/10.00000000)

N =   33
A Term =  -0.0131488916740660970 0*cos(3.1415927*33*x/10.00000000)
B Term =   0.2335927486566317900 0*sin(3.1415927*33*x/10.00000000)

N =   34
A Term =   0.0317851410866727340 0*cos(3.1415927*34*x/10.00000000)
B Term =  -0.2359412368923746200 0*sin(3.1415927*34*x/10.00000000)

N =   35
A Term =  -0.0181763564728117390 0*cos(3.1415927*35*x/10.00000000)
B Term =   0.2143667973912492000 0*sin(3.1415927*35*x/10.00000000)

N =   36
A Term =   0.0168389479116325820 0*cos(3.1415927*36*x/10.00000000)
B Term =  -0.2240434784928024800 0*sin(3.1415927*36*x/10.00000000)

N =   37
A Term =  -0.0243265679703376960 0*cos(3.1415927*37*x/10.00000000)
B Term =   0.2145593224436853100 0*sin(3.1415927*37*x/10.00000000)

N =   38
A Term =   0.0170134126316727720 0*cos(3.1415927*38*x/10.00000000)
B Term =  -0.2058825049975547500 0*sin(3.1415927*38*x/10.00000000)

N =   39
A Term =  -0.0212869544082824980 0*cos(3.1415927*39*x/10.00000000)
B Term =   0.2156436326263846400 0*sin(3.1415927*39*x/10.00000000)

N =   40
A Term =   0.0319690338953545620 0*cos(3.1415927*40*x/10.00000000)
B Term =  -0.1938666908277263100 0*sin(3.1415927*40*x/10.00000000)

N =   41
A Term =  -0.0160288241004595650 0*cos(3.1415927*41*x/10.00000000)
B Term =   0.1994643093002843000 0*sin(3.1415927*41*x/10.00000000)

N =   42
A Term =   0.0393659353586142060 0*cos(3.1415927*42*x/10.00000000)
B Term =  -0.1907782809665716000 0*sin(3.1415927*42*x/10.00000000)

N =   43
A Term =  -0.0194412232597659490 0*cos(3.1415927*43*x/10.00000000)
B Term =   0.1752665921403975800 0*sin(3.1415927*43*x/10.00000000)

N =   44
A Term =   0.0285876950775669460 0*cos(3.1415927*44*x/10.00000000)
B Term =  -0.1846858664208606300 0*sin(3.1415927*44*x/10.00000000)

N =   45
A Term =  -0.0265367162153402130 0*cos(3.1415927*45*x/10.00000000)
B Term =   0.1649578613930428300 0*sin(3.1415927*45*x/10.00000000)

N =   46
A Term =   0.0158286383689042950 0*cos(3.1415927*46*x/10.00000000)
```

B Term = -0.17021777617144418000*sin(3.1415927*46*x/10.00000000)

N = 47
A Term = -0.02507814195665177000*cos(3.1415927*47*x/10.00000000)
B Term = 0.17032042726322175000*sin(3.1415927*47*x/10.00000000)

N = 48
A Term = 0.01892457967576626600*cos(3.1415927*48*x/10.00000000)
B Term = -0.15837348021016978000*sin(3.1415927*48*x/10.00000000)

N = 49
A Term = -0.01731665576742365300*cos(3.1415927*49*x/10.00000000)
B Term = 0.17180061639874977000*sin(3.1415927*49*x/10.00000000)

N = 50
A Term = 0.03168666971098311300*cos(3.1415927*50*x/10.00000000)
B Term = -0.15756088993692205000*sin(3.1415927*50*x/10.00000000)

N = 51
A Term = -0.01689606063328836700*cos(3.1415927*51*x/10.00000000)
B Term = 0.15826736268999339000*sin(3.1415927*51*x/10.00000000)

N = 52
A Term = 0.03523298321666368200*cos(3.1415927*52*x/10.00000000)
B Term = -0.15840714248111584000*sin(3.1415927*52*x/10.00000000)

N = 53
A Term = -0.02564433517396170300*cos(3.1415927*53*x/10.00000000)
B Term = 0.14159985639404982000*sin(3.1415927*53*x/10.00000000)

N = 54
A Term = 0.02610452458390985200*cos(3.1415927*54*x/10.00000000)
B Term = -0.14883089350222131000*sin(3.1415927*54*x/10.00000000)

N = 55
A Term = -0.02968481085162888100*cos(3.1415927*55*x/10.00000000)
B Term = 0.13679117789105730000*sin(3.1415927*55*x/10.00000000)

N = 56
A Term = 0.01874072113117799000*cos(3.1415927*56*x/10.00000000)
B Term = -0.13451847846681267000*sin(3.1415927*56*x/10.00000000)

N = 57
A Term = -0.02220960163398961000*cos(3.1415927*57*x/10.00000000)
B Term = 0.14059500669783626000*sin(3.1415927*57*x/10.00000000)

N = 58
A Term = 0.02241508354580401500*cos(3.1415927*58*x/10.00000000)
B Term = -0.13014309409883673000*sin(3.1415927*58*x/10.00000000)

N = 59
A Term = -0.01526855385520465400*cos(3.1415927*59*x/10.00000000)
B Term = 0.13934107854961181000*sin(3.1415927*59*x/10.00000000)

N = 60
A Term = 0.02954065693639712200*cos(3.1415927*60*x/10.00000000)
B Term = -0.13517023525401087000*sin(3.1415927*60*x/10.00000000)

N = 61
A Term = -0.02049410402033369200*cos(3.1415927*61*x/10.00000000)
B Term = 0.12981081875725270000*sin(3.1415927*61*x/10.00000000)

N = 62

A Term = 0.02985287719262436800*cos(3.1415927*62*x/10.00000000)
B Term = -0.13416070163878444000*sin(3.1415927*62*x/10.00000000)

N = 63
A Term = -0.02998469094031682900*cos(3.1415927*63*x/10.00000000)
B Term = 0.12106134987919698000*sin(3.1415927*63*x/10.00000000)

N = 64
A Term = 0.02508532871450993100*cos(3.1415927*64*x/10.00000000)
B Term = -0.12158606129414624000*sin(3.1415927*64*x/10.00000000)

N = 65
A Term = -0.02877478945390350000*cos(3.1415927*65*x/10.00000000)
B Term = 0.11869366220116620000*sin(3.1415927*65*x/10.00000000)

N = 66
A Term = 0.02313216990965811700*cos(3.1415927*66*x/10.00000000)
B Term = -0.11088446870413478000*sin(3.1415927*66*x/10.00000000)

N = 67
A Term = -0.01889701778896906200*cos(3.1415927*67*x/10.00000000)
B Term = 0.11819920798825204000*sin(3.1415927*67*x/10.00000000)

N = 68
A Term = 0.02515445061853360500*cos(3.1415927*68*x/10.00000000)
B Term = -0.11294455287851746000*sin(3.1415927*68*x/10.00000000)

N = 69
A Term = -0.01614811779447110000*cos(3.1415927*69*x/10.00000000)
B Term = 0.11468592350343210000*sin(3.1415927*69*x/10.00000000)

N = 70
A Term = 0.02637699103210623000*cos(3.1415927*70*x/10.00000000)
B Term = -0.11872137102811642000*sin(3.1415927*70*x/10.00000000)

N = 71
A Term = -0.02488044892808013700*cos(3.1415927*71*x/10.00000000)
B Term = 0.11006755700208100000*sin(3.1415927*71*x/10.00000000)

N = 72
A Term = 0.02554426551445442000*cos(3.1415927*72*x/10.00000000)
B Term = -0.11378307790927356000*sin(3.1415927*72*x/10.00000000)

N = 73
A Term = -0.03132886187627011800*cos(3.1415927*73*x/10.00000000)
B Term = 0.10734375040054522000*sin(3.1415927*73*x/10.00000000)

N = 74
A Term = 0.02564479365057211300*cos(3.1415927*74*x/10.00000000)
B Term = -0.10111760445300262000*sin(3.1415927*74*x/10.00000000)

N = 75
A Term = -0.02569017606163896000*cos(3.1415927*75*x/10.00000000)
B Term = 0.10478722481254854000*sin(3.1415927*75*x/10.00000000)

N = 76
A Term = 0.02682840404423353400*cos(3.1415927*76*x/10.00000000)
B Term = -0.09590217657033799100*sin(3.1415927*76*x/10.00000000)

N = 77
A Term = -0.01729471778039086800*cos(3.1415927*77*x/10.00000000)
B Term = 0.10037251087629728000*sin(3.1415927*77*x/10.00000000)

```
N =   78
A Term =   0.025967735651538135 00*cos(3.1415927*78*x/10.00000000)
B Term =  -0.101363907312088660 00*sin(3.1415927*78*x/10.00000000)

N =   79
A Term =  -0.019276762172666446 00*cos(3.1415927*79*x/10.00000000)
B Term =   0.096749728313715699 00*sin(3.1415927*79*x/10.00000000)

N =   80
A Term =   0.023450574001014451 00*cos(3.1415927*80*x/10.00000000)
B Term =  -0.104326492782149730 00*sin(3.1415927*80*x/10.00000000)

N =   81
A Term =  -0.028052887644990594 00*cos(3.1415927*81*x/10.00000000)
B Term =   0.096551836397649859 00*sin(3.1415927*81*x/10.00000000)

N =   82
A Term =   0.023664063699623553 00*cos(3.1415927*82*x/10.00000000)
B Term =  -0.096466191542882274 00*sin(3.1415927*82*x/10.00000000)

N =   83
A Term =  -0.029860458046369071 00*cos(3.1415927*83*x/10.00000000)
B Term =   0.096548886947499149 00*sin(3.1415927*83*x/10.00000000)

N =   84
A Term =   0.027142155722247353 00*cos(3.1415927*84*x/10.00000000)
B Term =  -0.086788277651740964 00*sin(3.1415927*84*x/10.00000000)

N =   85
A Term =  -0.022604180718658232 00*cos(3.1415927*85*x/10.00000000)
B Term =   0.092322605800698523 00*sin(3.1415927*85*x/10.00000000)

N =   86
A Term =   0.028462583723000603 00*cos(3.1415927*86*x/10.00000000)
B Term =  -0.086524367907941754 00*sin(3.1415927*86*x/10.00000000)

N =   87
A Term =  -0.018151972807543132 00*cos(3.1415927*87*x/10.00000000)
B Term =   0.086297154985912894 00*sin(3.1415927*87*x/10.00000000)

N =   88
A Term =   0.024945427142468422 00*cos(3.1415927*88*x/10.00000000)
B Term =  -0.091761732625923520 00*sin(3.1415927*88*x/10.00000000)

N =   89
A Term =  -0.022993060470239284 00*cos(3.1415927*89*x/10.00000000)
B Term =   0.084638833835206803 00*sin(3.1415927*89*x/10.00000000)

N =   90
A Term =   0.021832684273596643 00*cos(3.1415927*90*x/10.00000000)
B Term =  -0.090791441935104092 00*sin(3.1415927*90*x/10.00000000)

N =   91
A Term =  -0.028869344042269297 00*cos(3.1415927*91*x/10.00000000)
B Term =   0.087042356785182032 00*sin(3.1415927*91*x/10.00000000)

N =   92
A Term =   0.024251124974084562 00*cos(3.1415927*92*x/10.00000000)
B Term =  -0.082712682636355173 00*sin(3.1415927*92*x/10.00000000)

N =   93
A Term =  -0.026900699442004163 00*cos(3.1415927*93*x/10.00000000)
B Term =   0.086554122622075291 00*sin(3.1415927*93*x/10.00000000)
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N =   94
A Term =   0.028561059704432193 00*cos(3.1415927*94*x/10.00000000)
B Term =  -0.077596403264483471 00*sin(3.1415927*94*x/10.00000000)

N =   95
A Term =  -0.021153688295173514 00*cos(3.1415927*95*x/10.00000000)
B Term =   0.080677358082811401 00*sin(3.1415927*95*x/10.00000000)

N =   96
A Term =   0.027823889734973940 00*cos(3.1415927*96*x/10.00000000)
B Term =  -0.079850904607621398 00*sin(3.1415927*96*x/10.00000000)

N =   97
A Term =  -0.020837670804487493 00*cos(3.1415927*97*x/10.00000000)
B Term =   0.075750583163827379 00*sin(3.1415927*97*x/10.00000000)

N =   98
A Term =   0.023084973716160001 00*cos(3.1415927*98*x/10.00000000)
B Term =  -0.082250497384356691 00*sin(3.1415927*98*x/10.00000000)

N =   99
A Term =  -0.025597496062253752 00*cos(3.1415927*99*x/10.00000000)
B Term =   0.076879925285593342 00*sin(3.1415927*99*x/10.00000000)

N =  100
A Term =   0.021935050746872038 00*cos(3.1415927*100*x/10.00000000)
B Term =  -0.078566854067443598 00*sin(3.1415927*100*x/10.00000000)
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Fourier Series of Coil #4 WaveForm

N = 0
A Term = 0.56617249999999986000*cos(3.1415927*0*x/10.00000000)
B Term = 0.00000000000000000000*sin(3.1415927*0*x/10.00000000)

N = 1
A Term = 1.09249254712821610000*cos(3.1415927*1*x/10.00000000)
B Term = -2.31789864232462420000*sin(3.1415927*1*x/10.00000000)

N = 2
A Term = 0.00981179087095048790*cos(3.1415927*2*x/10.00000000)
B Term = -0.04112489142801858300*sin(3.1415927*2*x/10.00000000)

N = 3
A Term = -0.77748985612891275000*cos(3.1415927*3*x/10.00000000)
B Term = -0.31261244856835335000*sin(3.1415927*3*x/10.00000000)

N = 4
A Term = -0.21395885460663036000*cos(3.1415927*4*x/10.00000000)
B Term = -0.49731561287915355000*sin(3.1415927*4*x/10.00000000)

N = 5
A Term = -0.06326466246765757900*cos(3.1415927*5*x/10.00000000)
B Term = -0.01474582744236930400*sin(3.1415927*5*x/10.00000000)

N = 6
A Term = -0.14793156423871748000*cos(3.1415927*6*x/10.00000000)
B Term = 0.14046831528945039000*sin(3.1415927*6*x/10.00000000)

N = 7
A Term = -0.24797168551359183000*cos(3.1415927*7*x/10.00000000)
B Term = 0.10920604048146498000*sin(3.1415927*7*x/10.00000000)

N = 8
A Term = -0.10529937270414663000*cos(3.1415927*8*x/10.00000000)
B Term = -0.09912804285685128400*sin(3.1415927*8*x/10.00000000)

N = 9
A Term = 0.17167131777537348000*cos(3.1415927*9*x/10.00000000)
B Term = 0.04169883644591979000*sin(3.1415927*9*x/10.00000000)

N = 10
A Term = -0.03604389302164717100*cos(3.1415927*10*x/10.00000000)
B Term = 0.16030589009013940000*sin(3.1415927*10*x/10.00000000)

N = 11
A Term = -0.05687946556362513700*cos(3.1415927*11*x/10.00000000)
B Term = -0.04157379940630168100*sin(3.1415927*11*x/10.00000000)

N = 12
A Term = 0.00746347100707194300*cos(3.1415927*12*x/10.00000000)
B Term = -0.07741448217908968000*sin(3.1415927*12*x/10.00000000)

N = 13
A Term = 0.04677965051303101900*cos(3.1415927*13*x/10.00000000)
B Term = -0.05168827145398219300*sin(3.1415927*13*x/10.00000000)

N = 14
A Term = 0.01881935686424155600*cos(3.1415927*14*x/10.00000000)
B Term = 0.06393327808509162400*sin(3.1415927*14*x/10.00000000)

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N =   15
A Term =  -0.14926251694484238000*cos(3.1415927*15*x/10.00000000)
B Term =   0.00430833019779906530*sin(3.1415927*15*x/10.00000000)

N =   16
A Term =   0.00400934689146752090*cos(3.1415927*16*x/10.00000000)
B Term =  -0.09107947879529254600*sin(3.1415927*16*x/10.00000000)

N =   17
A Term =   0.04107199162903536100*cos(3.1415927*17*x/10.00000000)
B Term =   0.04480550109050864700*sin(3.1415927*17*x/10.00000000)

N =   18
A Term =  -0.02513483010903990200*cos(3.1415927*18*x/10.00000000)
B Term =   0.05328141397033510400*sin(3.1415927*18*x/10.00000000)

N =   19
A Term =  -0.02319750824937588300*cos(3.1415927*19*x/10.00000000)
B Term =   0.01486304287795250400*sin(3.1415927*19*x/10.00000000)

N =   20
A Term =  -0.02981677853568691700*cos(3.1415927*20*x/10.00000000)
B Term =  -0.04877271975207420100*sin(3.1415927*20*x/10.00000000)

N =   21
A Term =   0.08234647111292993400*cos(3.1415927*21*x/10.00000000)
B Term =  -0.02280237125775157500*sin(3.1415927*21*x/10.00000000)

N =   22
A Term =  -0.01755909709160662800*cos(3.1415927*22*x/10.00000000)
B Term =   0.06396359476175053600*sin(3.1415927*22*x/10.00000000)

N =   23
A Term =  -0.06736754162658392700*cos(3.1415927*23*x/10.00000000)
B Term =  -0.02724784418945111100*sin(3.1415927*23*x/10.00000000)

N =   24
A Term =   0.01342347891048435700*cos(3.1415927*24*x/10.00000000)
B Term =  -0.03836727371815250300*sin(3.1415927*24*x/10.00000000)

N =   25
A Term =   0.00649006668336018790*cos(3.1415927*25*x/10.00000000)
B Term =   0.01044439965961951000*sin(3.1415927*25*x/10.00000000)

N =   26
A Term =   0.01623500452876516400*cos(3.1415927*26*x/10.00000000)
B Term =   0.03832471896222652800*sin(3.1415927*26*x/10.00000000)

N =   27
A Term =  -0.05164227255180037200*cos(3.1415927*27*x/10.00000000)
B Term =   0.01833808584766311000*sin(3.1415927*27*x/10.00000000)

N =   28
A Term =   0.00453933015923544110*cos(3.1415927*28*x/10.00000000)
B Term =  -0.05186192618569127100*sin(3.1415927*28*x/10.00000000)

N =   29
A Term =   0.05528616183023992600*cos(3.1415927*29*x/10.00000000)
B Term =   0.00540162460879087780*sin(3.1415927*29*x/10.00000000)

N =   30
A Term =  -0.02322276098659497400*cos(3.1415927*30*x/10.00000000)
B Term =   0.03022148830030148600*sin(3.1415927*30*x/10.00000000)
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N =   31
A Term =  -0.0244306906255693170 0*cos(3.1415927*31*x/10.00000000)
B Term =  -0.0164469988449758680 0*sin(3.1415927*31*x/10.00000000)

N =   32
A Term =  -0.0182161391323719740 0*cos(3.1415927*32*x/10.00000000)
B Term =  -0.0286372743915604860 0*sin(3.1415927*32*x/10.00000000)

N =   33
A Term =   0.0258784585036129010 0*cos(3.1415927*33*x/10.00000000)
B Term =  -0.0018289741515796069 0*sin(3.1415927*33*x/10.00000000)

N =   34
A Term =  -0.0038063038668983739 0*cos(3.1415927*34*x/10.00000000)
B Term =   0.0440156836182743900 0*sin(3.1415927*34*x/10.00000000)

N =   35
A Term =  -0.0429644246442310310 0*cos(3.1415927*35*x/10.00000000)
B Term =   0.0051816883851957783 0*sin(3.1415927*35*x/10.00000000)

N =   36
A Term =   0.0194750151476944170 0*cos(3.1415927*36*x/10.00000000)
B Term =  -0.0277016680279423520 0*sin(3.1415927*36*x/10.00000000)

N =   37
A Term =   0.0271523250506304110 0*cos(3.1415927*37*x/10.00000000)
B Term =   0.0066486959528707888 0*sin(3.1415927*37*x/10.00000000)

N =   38
A Term =   0.0077298969274973749 0*cos(3.1415927*38*x/10.00000000)
B Term =   0.0214080145859582260 0*sin(3.1415927*38*x/10.00000000)

N =   39
A Term =  -0.0291008195931753040 0*cos(3.1415927*39*x/10.00000000)
B Term =  -0.0107871817216133490 0*sin(3.1415927*39*x/10.00000000)

N =   40
A Term =  -0.0052387813381904874 0*cos(3.1415927*40*x/10.00000000)
B Term =  -0.0357312687461439000 0*sin(3.1415927*40*x/10.00000000)

N =   41
A Term =   0.0236047629271961890 0*cos(3.1415927*41*x/10.00000000)
B Term =  -0.0004426554248190902 0*sin(3.1415927*41*x/10.00000000)

N =   42
A Term =  -0.0208034976096947090 0*cos(3.1415927*42*x/10.00000000)
B Term =   0.0271737908489626600 0*sin(3.1415927*42*x/10.00000000)

N =   43
A Term =  -0.0248390289706875020 0*cos(3.1415927*43*x/10.00000000)
B Term =   0.0056863891659142910 0*sin(3.1415927*43*x/10.00000000)

N =   44
A Term =  -0.0041488175693727095 0*cos(3.1415927*44*x/10.00000000)
B Term =  -0.0187069707090105270 0*sin(3.1415927*44*x/10.00000000)

N =   45
A Term =   0.0317144856613089730 0*cos(3.1415927*45*x/10.00000000)
B Term =   0.0105388264025459700 0*sin(3.1415927*45*x/10.00000000)

N =   46
A Term =   0.0046891929920227894 0*cos(3.1415927*46*x/10.00000000)
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B Term =   0.02752936935293270500*sin(3.1415927*46*x/10.00000000)

N =   47
A Term =  -0.02272593657108745400*cos(3.1415927*47*x/10.00000000)
B Term =  -0.01112248324420425500*sin(3.1415927*47*x/10.00000000)

N =   48
A Term =   0.01397743790271679200*cos(3.1415927*48*x/10.00000000)
B Term =  -0.02470350495208207800*sin(3.1415927*48*x/10.00000000)

N =   49
A Term =   0.01021185128754429500*cos(3.1415927*49*x/10.00000000)
B Term =  -0.00899956149044097400*sin(3.1415927*49*x/10.00000000)

N =   50
A Term =  -0.00294503367668482550*cos(3.1415927*50*x/10.00000000)
B Term =   0.01949396818174421700*sin(3.1415927*50*x/10.00000000)

N =   51
A Term =  -0.03271457524882915400*cos(3.1415927*51*x/10.00000000)
B Term =  -0.00089064520998476050*sin(3.1415927*51*x/10.00000000)

N =   52
A Term =  -0.00604495086443738140*cos(3.1415927*52*x/10.00000000)
B Term =  -0.02244617615981126300*sin(3.1415927*52*x/10.00000000)

N =   53
A Term =   0.02708269626803621100*cos(3.1415927*53*x/10.00000000)
B Term =   0.01774578110907269400*sin(3.1415927*53*x/10.00000000)

N =   54
A Term =  -0.01182899689958353900*cos(3.1415927*54*x/10.00000000)
B Term =   0.01936693249441007200*sin(3.1415927*54*x/10.00000000)

N =   55
A Term =  -0.00515750086941284100*cos(3.1415927*55*x/10.00000000)
B Term =   0.00213869906170930690*sin(3.1415927*55*x/10.00000000)

N =   56
A Term =   0.00300092187372739010*cos(3.1415927*56*x/10.00000000)
B Term =  -0.02002084345616441500*sin(3.1415927*56*x/10.00000000)

N =   57
A Term =   0.02033055804109628800*cos(3.1415927*57*x/10.00000000)
B Term =  -0.00781400247078987630*sin(3.1415927*57*x/10.00000000)

N =   58
A Term =   0.00233154693600249850*cos(3.1415927*58*x/10.00000000)
B Term =   0.02200449020186051200*sin(3.1415927*58*x/10.00000000)

N =   59
A Term =  -0.03431615861781579800*cos(3.1415927*59*x/10.00000000)
B Term =  -0.01476626517866104500*sin(3.1415927*59*x/10.00000000)

N =   60
A Term =   0.00793568465276016030*cos(3.1415927*60*x/10.00000000)
B Term =  -0.01385648442370168500*sin(3.1415927*60*x/10.00000000)

N =   61
A Term =   0.00723145867476599620*cos(3.1415927*61*x/10.00000000)
B Term =   0.00710424121692789390*sin(3.1415927*61*x/10.00000000)

N =   62
```

A Term = -0.0045602420652018768*cos(3.1415927*62*x/10.00000000)
B Term = 0.017175582788679308*sin(3.1415927*62*x/10.00000000)

N = 63
A Term = -0.009744523873848143*cos(3.1415927*63*x/10.00000000)
B Term = 0.008646981399810971*sin(3.1415927*63*x/10.00000000)

N = 64
A Term = -0.002453357102255891*cos(3.1415927*64*x/10.00000000)
B Term = -0.024174071628821028*sin(3.1415927*64*x/10.00000000)

N = 65
A Term = 0.029701872983126439*cos(3.1415927*65*x/10.00000000)
B Term = 0.006968239483585706*sin(3.1415927*65*x/10.00000000)

N = 66
A Term = -0.008577324523336979*cos(3.1415927*66*x/10.00000000)
B Term = 0.011716396837647473*sin(3.1415927*66*x/10.00000000)

N = 67
A Term = -0.017362467110153105*cos(3.1415927*67*x/10.00000000)
B Term = -0.010830876857387504*sin(3.1415927*67*x/10.00000000)

N = 68
A Term = 0.003420938699845405*cos(3.1415927*68*x/10.00000000)
B Term = -0.011294185045911606*sin(3.1415927*68*x/10.00000000)

N = 69
A Term = 0.004207585101653858*cos(3.1415927*69*x/10.00000000)
B Term = -0.003377447893686698*sin(3.1415927*69*x/10.00000000)

N = 70
A Term = 0.001240395566295890*cos(3.1415927*70*x/10.00000000)
B Term = 0.024976026516080232*sin(3.1415927*70*x/10.00000000)

N = 71
A Term = -0.020526293728811047*cos(3.1415927*71*x/10.00000000)
B Term = -0.002142417631083992*sin(3.1415927*71*x/10.00000000)

N = 72
A Term = 0.007027086964749849*cos(3.1415927*72*x/10.00000000)
B Term = -0.013903574899380431*sin(3.1415927*72*x/10.00000000)

N = 73
A Term = 0.020905292601060915*cos(3.1415927*73*x/10.00000000)
B Term = 0.008190131875534707*sin(3.1415927*73*x/10.00000000)

N = 74
A Term = -0.005397477289475370*cos(3.1415927*74*x/10.00000000)
B Term = 0.005723351025813452*sin(3.1415927*74*x/10.00000000)

N = 75
A Term = -0.009744146095352266*cos(3.1415927*75*x/10.00000000)
B Term = -0.001137110286774241*sin(3.1415927*75*x/10.00000000)

N = 76
A Term = -0.002317958337196229*cos(3.1415927*76*x/10.00000000)
B Term = -0.021963684228375680*sin(3.1415927*76*x/10.00000000)

N = 77
A Term = 0.010807882026684243*cos(3.1415927*77*x/10.00000000)
B Term = 0.003179097962393686*sin(3.1415927*77*x/10.00000000)

B Term = 0.02752936935293270500*sin(3.1415927*46*x/10.00000000)

N = 47
A Term = -0.02272593657108745400*cos(3.1415927*47*x/10.00000000)
B Term = -0.01112248324420425500*sin(3.1415927*47*x/10.00000000)

N = 48
A Term = 0.01397743790271679200*cos(3.1415927*48*x/10.00000000)
B Term = -0.02470350495208207800*sin(3.1415927*48*x/10.00000000)

N = 49
A Term = 0.01021185128754429500*cos(3.1415927*49*x/10.00000000)
B Term = -0.00899956149044097400*sin(3.1415927*49*x/10.00000000)

N = 50
A Term = -0.00294503367668482550*cos(3.1415927*50*x/10.00000000)
B Term = 0.01949396818174421700*sin(3.1415927*50*x/10.00000000)

N = 51
A Term = -0.03271457524882915400*cos(3.1415927*51*x/10.00000000)
B Term = -0.00089064520998476050*sin(3.1415927*51*x/10.00000000)

N = 52
A Term = -0.00604495086443738140*cos(3.1415927*52*x/10.00000000)
B Term = -0.02244617615981126300*sin(3.1415927*52*x/10.00000000)

N = 53
A Term = 0.02708269626803621100*cos(3.1415927*53*x/10.00000000)
B Term = 0.01774578110907269400*sin(3.1415927*53*x/10.00000000)

N = 54
A Term = -0.01182899689958353900*cos(3.1415927*54*x/10.00000000)
B Term = 0.01936693249441007200*sin(3.1415927*54*x/10.00000000)

N = 55
A Term = -0.00515750086941284100*cos(3.1415927*55*x/10.00000000)
B Term = 0.00213869906170930690*sin(3.1415927*55*x/10.00000000)

N = 56
A Term = 0.00300092187372739010*cos(3.1415927*56*x/10.00000000)
B Term = -0.02002084345616441500*sin(3.1415927*56*x/10.00000000)

N = 57
A Term = 0.02033055804109628800*cos(3.1415927*57*x/10.00000000)
B Term = -0.00781400247078987630*sin(3.1415927*57*x/10.00000000)

N = 58
A Term = 0.00233154693600249850*cos(3.1415927*58*x/10.00000000)
B Term = 0.02200449020186051200*sin(3.1415927*58*x/10.00000000)

N = 59
A Term = -0.03431615861781579800*cos(3.1415927*59*x/10.00000000)
B Term = -0.01476626517866104500*sin(3.1415927*59*x/10.00000000)

N = 60
A Term = 0.00793568465276016030*cos(3.1415927*60*x/10.00000000)
B Term = -0.01385648442370168500*sin(3.1415927*60*x/10.00000000)

N = 61
A Term = 0.00723145867476599620*cos(3.1415927*61*x/10.00000000)
B Term = 0.00710424121692789390*sin(3.1415927*61*x/10.00000000)

N = 62

A Term = -0.0045602420652018768*cos(3.1415927*62*x/10.00000000)
B Term = 0.017175582788679308*sin(3.1415927*62*x/10.00000000)

N = 63
A Term = -0.009744523873848143*cos(3.1415927*63*x/10.00000000)
B Term = 0.008646981399810971*sin(3.1415927*63*x/10.00000000)

N = 64
A Term = -0.002453357102255891*cos(3.1415927*64*x/10.00000000)
B Term = -0.024174071628821028*sin(3.1415927*64*x/10.00000000)

N = 65
A Term = 0.029701872983126439*cos(3.1415927*65*x/10.00000000)
B Term = 0.006968239483585706*sin(3.1415927*65*x/10.00000000)

N = 66
A Term = -0.008577324523336979*cos(3.1415927*66*x/10.00000000)
B Term = 0.011716396837647473*sin(3.1415927*66*x/10.00000000)

N = 67
A Term = -0.017362467110153105*cos(3.1415927*67*x/10.00000000)
B Term = -0.010830876857387504*sin(3.1415927*67*x/10.00000000)

N = 68
A Term = 0.003420938699845405*cos(3.1415927*68*x/10.00000000)
B Term = -0.011294185045911606*sin(3.1415927*68*x/10.00000000)

N = 69
A Term = 0.004207585101653858*cos(3.1415927*69*x/10.00000000)
B Term = -0.003377447893686698*sin(3.1415927*69*x/10.00000000)

N = 70
A Term = 0.001240395566295890*cos(3.1415927*70*x/10.00000000)
B Term = 0.024976026516080232*sin(3.1415927*70*x/10.00000000)

N = 71
A Term = -0.020526293728811047*cos(3.1415927*71*x/10.00000000)
B Term = -0.002142417631083992*sin(3.1415927*71*x/10.00000000)

N = 72
A Term = 0.007027086964749849*cos(3.1415927*72*x/10.00000000)
B Term = -0.013903574899380431*sin(3.1415927*72*x/10.00000000)

N = 73
A Term = 0.020905292601060915*cos(3.1415927*73*x/10.00000000)
B Term = 0.008190131875534707*sin(3.1415927*73*x/10.00000000)

N = 74
A Term = -0.005397477289475370*cos(3.1415927*74*x/10.00000000)
B Term = 0.005723351025813452*sin(3.1415927*74*x/10.00000000)

N = 75
A Term = -0.009744146095352266*cos(3.1415927*75*x/10.00000000)
B Term = -0.001137110286774241*sin(3.1415927*75*x/10.00000000)

N = 76
A Term = -0.002317958337196229*cos(3.1415927*76*x/10.00000000)
B Term = -0.021963684228375680*sin(3.1415927*76*x/10.00000000)

N = 77
A Term = 0.010807882026684243*cos(3.1415927*77*x/10.00000000)
B Term = 0.003179097962393686*sin(3.1415927*77*x/10.00000000)

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N =   78
A Term =  -0.00665140754206137910*cos(3.1415927*78*x/10.00000000)
B Term =   0.01791275789818169400*sin(3.1415927*78*x/10.00000000)

N =   79
A Term =  -0.01793034566028110400*cos(3.1415927*79*x/10.00000000)
B Term =  -0.00461813302022995050*sin(3.1415927*79*x/10.00000000)

N =   80
A Term =   0.00564425421353095640*cos(3.1415927*80*x/10.00000000)
B Term =  -0.00367366629853589510*sin(3.1415927*80*x/10.00000000)

N =   81
A Term =   0.01541832536973611300*cos(3.1415927*81*x/10.00000000)
B Term =   0.00062323749650626179*sin(3.1415927*81*x/10.00000000)

N =   82
A Term =   0.00063109435374041913*cos(3.1415927*82*x/10.00000000)
B Term =   0.01618455773494796600*sin(3.1415927*82*x/10.00000000)

N =   83
A Term =  -0.01058925718458241500*cos(3.1415927*83*x/10.00000000)
B Term =  -0.00628860531959835220*sin(3.1415927*83*x/10.00000000)

N =   84
A Term =   0.00414014139447912640*cos(3.1415927*84*x/10.00000000)
B Term =  -0.02011236363676289000*sin(3.1415927*84*x/10.00000000)

N =   85
A Term =   0.00917247192479116010*cos(3.1415927*85*x/10.00000000)
B Term =   0.00518839745243783110*sin(3.1415927*85*x/10.00000000)

N =   86
A Term =  -0.00648514514502907330*cos(3.1415927*86*x/10.00000000)
B Term =   0.00543494720765342730*sin(3.1415927*86*x/10.00000000)

N =   87
A Term =  -0.01718658620480913200*cos(3.1415927*87*x/10.00000000)
B Term =   0.00280033832777892710*sin(3.1415927*87*x/10.00000000)

N =   88
A Term =   0.00034537575385590845*cos(3.1415927*88*x/10.00000000)
B Term =  -0.01089825880717670500*sin(3.1415927*88*x/10.00000000)

N =   89
A Term =   0.01487869741345353900*cos(3.1415927*89*x/10.00000000)
B Term =   0.00608046246394765980*sin(3.1415927*89*x/10.00000000)

N =   90
A Term =  -0.00397363565827067460*cos(3.1415927*90*x/10.00000000)
B Term =   0.01888951788189512100*sin(3.1415927*90*x/10.00000000)

N =   91
A Term =  -0.00533687574762478110*cos(3.1415927*91*x/10.00000000)
B Term =  -0.00939670010485410550*sin(3.1415927*91*x/10.00000000)

N =   92
A Term =   0.00463043960242224850*cos(3.1415927*92*x/10.00000000)
B Term =  -0.00846707235118616610*sin(3.1415927*92*x/10.00000000)

N =   93
A Term =   0.01110792542036384900*cos(3.1415927*93*x/10.00000000)
B Term =  -0.00380977408383048000*sin(3.1415927*93*x/10.00000000)
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```
N =   94
A Term =  -0.0022364374033201997*cos(3.1415927*94*x/10.00000000)
B Term =   0.0085023903267461443*sin(3.1415927*94*x/10.00000000)

N =   95
A Term =  -0.0195983487356255310*cos(3.1415927*95*x/10.00000000)
B Term =  -0.0015338892481595585*sin(3.1415927*95*x/10.00000000)

N =   96
A Term =   0.0040578361029463350*cos(3.1415927*96*x/10.00000000)
B Term =  -0.0156492435219751920*sin(3.1415927*96*x/10.00000000)

N =   97
A Term =   0.0068250766674066120*cos(3.1415927*97*x/10.00000000)
B Term =   0.0123404362994507970*sin(3.1415927*97*x/10.00000000)

N =   98
A Term =  -0.0038498251346173601*cos(3.1415927*98*x/10.00000000)
B Term =   0.0099799550624490897*sin(3.1415927*98*x/10.00000000)

N =   99
A Term =  -0.0052335251594001243*cos(3.1415927*99*x/10.00000000)
B Term =  -0.0000327988959891392*sin(3.1415927*99*x/10.00000000)

N =  100
A Term =   0.0013926112271025505*cos(3.1415927*100*x/10.00000000)
B Term =  -0.0086628214700720848*sin(3.1415927*100*x/10.00000000)
```